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## **Contexts for Training**

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John Morrison

## PREFACE

This document is based on a chapter of a book entitled *Handbook of Training*, currently being edited by Sigmund Tobias and Dexter Fletcher and to be published by Macmillan. The handbook is intended to be a professional resource on training for educational psychologists and trainers. The work was supported by a Corporate Research Project (CRP) at the Institute for Defense Analyses (IDA).

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## **SUMMARY**

This document defines training "contexts" as the collection of situations and conditions that typify training in a domain of jobs and that determine, to a large extent, the nature and type of training conducted in that domain. By "training," we refer to the pedagogical process intended to convey knowledge and skills. In that sense, training is functionally similar to "education."

Training and education are usually distinguished by two defining characteristics. The first characteristic relates to the degree to which learning is expected to generalize across settings. Training is intended to impart the knowledge and skills that are directly related to specific job context, whereas education inculcates competencies that are applicable to general life situations. The second characteristic relates to the context in which the pedagogical process occurs. Education is normally defined as the instructional process that occurs in traditional educational settings (i.e., in primary/secondary schools or institutions of higher learning), whereas training is conducted outside of those settings, usually at or near the workplace.

For our purposes, we define training contexts as those instructional processes—however general or specific they may be—that fall outside of the traditional educational context.

### **A. HISTORICAL AND CONCEPTUAL CONTEXTS**

The contexts for training in contemporary America are rooted in historical tradition and theoretical concepts, both of which are discussed in some detail.

#### **1. Historical Contexts**

Both training and education in colonial America trace their origin to the same place: the household. However, as the American workplace became more urbanized and demanded higher skill levels, apprenticeship became an increasingly important form of training. Other historical developments in the 18<sup>th</sup> century that impacted job training contexts were the development of proprietary schools and Benjamin Franklin's concept of the comprehensive high school, which included some elements of vocational training. The

tradition of training part-time reservists for military duty also began in 18<sup>th</sup> century America.

During the 19<sup>th</sup> century, the American public school system was established and would later become an important context for vocational training in America. For post-secondary education, the Morrill Act set up a system of land grant universities to emphasize training in agriculture, industrial, and military arts. In addition to the land grant colleges, the Army and Navy military academies, both of which were established in the 19<sup>th</sup> century, also provided professional education in the military arts. Factory schools, which emerged in the latter part of the century, were created to produce a work force for a particular employer.

At the start of the 20<sup>th</sup> century, the Smith Act provided subsidies for vocational training in American high schools. This act also increased the amount of regulation and oversight imposed on this form of vocational training. Even though the trade union movement began shortly after the Civil War, not until well into the 20<sup>th</sup> century would trade unions become a major factor in worker training. The two world wars of this century also necessitated the development of methods for quickly training masses of men and women in military jobs.

## **2. Conceptual Contexts**

Training practices in the United States have evolved over the years. The theoretical and research concepts that underlie the modern practice of training, in contrast, are relatively new developments—most dating to the present century.

Two educational theorists, active in the early part of the 20<sup>th</sup> century have had lasting effects on modern theory and practice related to training. One was John Dewey (1859–1952), who promoted “learning by doing” and laid the theoretical foundation for the “project method” of instruction, which has had a pervasive impact on industrial arts and technology education. The other was E. L. Thorndike (1874–1949), who developed a mechanistic theory of learning and skill transfer that has had a lasting effect on analyses of tasks and the construction of training devices and simulators. Although these two men disagreed on the nature of the learning processes that underlie training and education, they agreed that training in practical skills in vocational education is as important as academic topics taught in traditional education.

In the middle part of the 20<sup>th</sup> century, two new theoretical frameworks arose and had a profound effect on modern training practices. The first was behaviorism, the belief



that learning can only be studied through its effects on objective and observable performance. One important outgrowth of behaviorism was the adoption of behavioral objectives as the core concept in training development and practice. The other framework was provided by systems theory, which is a multi-disciplinary approach for describing and predicting the performance of complex real-world phenomena. Systems theory has had a lasting effect on the practice of training development.

The latter part of the 20<sup>th</sup> century has seen the application of cognitive theory to training practices. This theoretical trend has had at least two concrete effects on training research and practice:

1. The greater use of mental constructs to define task requirements
2. The increased willingness to devise training interventions for mentally demanding tasks.

## **B. CONTEMPORARY TRAINING CONTEXTS AND VENUES**

In contemporary America, training is provided in multiple venues under the aegis of diverse organizations. An initial review of those contexts revealed a clear differentiation in military and civilian contexts; consequently, we described training venues within those two broad contexts separately.

### **1. Military Training**

Most training venues can be classified by two binary distinctions. The first is whether the training occurs in an institutional setting or in the unit. According to Gorman (1993), institutional training is defined as that where students travel from their home station to a permanent physical facility with a fixed instructional faculty and curricula. Unit training, in contrast, occurs at home station where the population is fixed but uses the unit's resources, which are often not fixed. The second distinction is between training for individuals vs. training for collections of individuals. These "collectives" vary widely from small teams comprising a few personnel to large military organizations formed by aggregating teams of teams and comprising thousands of personnel. When combined with one another, these two distinctions form four unique categories of military training venues.

#### **a. Individual Training Conducted in Institutions**

This form of military training most closely resembles traditional civilian education. Although individual training in institutions is often associated with basic or entry-level training, this form of military training is used throughout the military Service member's

career. A unique characteristic of this particular venue is that the U.S. Congress requires all Services to maintain detailed statistics on training load and costs.

#### **b. Individual Training Conducted in Units**

Military units conduct individual training for a variety of reasons. One reason is that the initial training that Service personnel receive in the institution is not sufficient to ensure adequate performance on the job. On-the-job training (OJT) is an often-used approach during which individuals learn aspects of their jobs as they perform these jobs. Other forms of training (e.g., conventional lectures) can also be used to fulfill training requirements. The unfortunate thread that runs through the various forms of this training venue is that training is usually unstructured and undocumented.

#### **c. Collective Training Conducted in Institutions**

This venue represents training controlled by a permanent faculty, located in permanent facilities, and conducted according to a standard curriculum. With the relatively recent development of instrumented ranges, it has developed as the appropriate site for training advanced warfighting skills. Examples include the U.S. Navy's TOP GUN Fighter Weapons School, which was established in 1968 at Miramar, California, and the U.S. Army's National Training Center (NTC), which was established in 1981 at Fort Irwin, California.

#### **d. Collective Training Conducted in Units**

The fourth venue represents the fundamental approach that military units use to train and maintain their readiness. A fundamental attribute of this venue is that units conduct training with either their actual equipment or high-fidelity simulations of their equipment. The underlying imperative to this training is that units "train as they would fight." This particular venue is likely to benefit from recent technological developments in which simulation capabilities are embedded in weapon systems.

### **2. Civilian Training**

The venues for civilian training are extremely diverse. Our review maps this diverse domain by describing eight of the more important forms of civilian training.

#### **a. Vocational Training in Public High Schools**

The most familiar aspect of vocational education in public K-12 schools is the "shop class," which has been a long-standing feature of comprehensive secondary schools.

Training in auto mechanics, woodworking, metalworking, and other skills are commonly offered in the vocational classes in secondary schools.

#### **b. Employer-Provided, Formal Job Training Programs**

The single largest category of training in the civilian sector includes employer-provided programs. According to the Bureau of Labor Statistics (1996), the industries that provided the most hours of formal training were transportation, communications, and public utilities. The industries that provided the fewest number of hours of formal training were retail trades and construction.

#### **c. Union and Professional Organizations Training**

Unions have expanded training opportunities for union members by negotiating funding for such training in contracts and by providing training as a benefit to union members through funds from dues, state or federal funding, or foundation grants. This venue refers to union training that is provided under the aegis of the union.

#### **d. Joint Union/Management Training**

The other venue for union involvement in management training is that which is funded by contractual agreement between labor and management and is jointly administered by union and management parties to the contract.

#### **e. Informal "On-The-Job" Training**

The problems attending the measurement of informal training often cause it to be given less attention in discussions of training. Nevertheless, the research on informal training points to its importance in equipping workers with the job skills they actually use in their work.

#### **f. Apprenticeships**

Historically, apprenticeship programs involved putting an aspiring tradesperson into a work situation where he could work with a master and learn by watching and doing under the scrutiny and tutelage of the master in a typically unstructured way. In the United States, apprenticeship programs continue to be an important form of worker training.

#### **g. Proprietary Training**

Proprietary training vendors include individuals who offer training services and large-scale schools that offer training in a range of occupations, from electronics to truck

driving. While "for profit" was the most common element in the definition of proprietary schools, some states referred to any occupational or trade schools as proprietary whether they were for-profit operations or not.

#### **h. Community Colleges**

Community colleges represent a fairly new institution and have a substantial involvement in training. They represent an important training vehicle for small local businesses that lack the resources to mount training programs within the context of their firm. Large corporations have also cooperated with community colleges.

#### **i. Distance Training/Internet**

The oldest form of distance training is correspondence courses, which are still widely used today. Proprietary schools and public institutions offer correspondence courses for college credit courses and for technical training. Other forms of distance training include distributing videotapes or audiotapes and providing one-way video through broadcast television. Distance training through the multimedia capability of the World Wide Web constitutes the newest venue for training. The appeal distance training is the perception of favorable cost and performance conditions.

### **C. CONCLUSIONS**

Our review indicates considerable diversity across military and civilian training contexts. The diversity of contexts is an impediment to research on describing the content and the main effects of training. On the other hand, this diversity may provide an opportunity to study the interactions between content, context, and other key variables.

## **I. INTRODUCTION**

In this document, we discuss some of the more important contexts in which job training is conducted. By "contexts," we refer to the collection of training situations and conditions that typify training in a domain of jobs and that determine, to a large extent, the nature and type of training conducted in that domain. Our discussion includes historical and theoretical contexts for job training, as well as the physical contexts and venues for contemporary job training situations. Although this document is focused primarily on training contexts that pertain to North America, particularly the United States, important deviations from training models and contexts that have emerged from other cultures are pointed out, as appropriate.

### **A. SOME BASIC CONCEPTS AND DEFINITIONS**

In a broad conceptual context, training can be viewed as one of several different methods designed to enhance job performance. Training enhances job performance by promoting the acquisition of job-relevant knowledge and skills. Other performance enhancement methods include job aiding, which conveys job-related information to incumbents as they perform job tasks using technical manuals, computer-based helps, or some other performance support system; personnel selection and classification, which seeks to provide the optimal match of personnel to job requirements; and job design and human factors, which modify job requirements to match human capabilities. These alternative methods for human performance improvement are related to training in that they potentially enhance or diminish its effects. In other words, training is properly conceived as a single component of an interrelated array of performance enhancement techniques. Although the focus of this document is on training per se, these techniques provide an important conceptual context for the design, development, and delivery of training.

Another concept related to training is education. Like education, training is defined as an instructional process. The differences between the two concepts are usually drawn from two characteristics of this process: its context and its generality. With regard to context, education is normally defined as the instructional process that occurs in traditional educational settings (i.e., in primary/secondary schools or institutions of higher learning), whereas training is conducted outside of those settings, usually at or near the workplace.

The second distinction relates to the functions of training and education, pertaining to the degree to which learning is expected to generalize across settings. The competencies (i.e., the knowledge and skills) imparted by training are meant to apply to a specific job context, whereas education inculcates competencies that are applicable to general life situations.

Scott and Meyer (1994) point out that these traditional distinctions between training and education do not always hold. To illustrate, consider the contexts arrayed in the matrix in Table I-1. The first two columns represent programs within the context of traditional public or private education, whereas the remaining three columns (business, military, and religion) are outside of that context. The vertical dimension of this matrix represents the generality of the instructional programs, such that programs at the top (degree programs) are the most general while those at the bottom (non-degree programs) are the most specific. Programs located in the top left of the matrix (degree programs at colleges and universities) are clearly identified as educational in nature, whereas those in the bottom right (non-degree programs in business, military, or religious contexts) are unambiguously identified as training. In contrast, the examples in the top right and lower left are more difficult to classify. They indicate that highly generalizable "education" programs may be implemented outside of the traditional educational context (e.g., corporate colleges), just as highly specific "training" courses may be conducted within a traditional educational context (e.g., adult education programs).

For our purposes, we define training contexts as those instructional processes—however specific or general they may be—that fall outside of the traditional educational context. By so doing, we exclude a discussion of professional education (e.g., as provided in schools of law or medicine). These programs share features of traditional job training. The most important feature is that both are designed to impart job knowledge and skills related to specific jobs. However, professional education more closely resembles traditional undergraduate and graduate education in two respects. First, the academic requirements for professional education are more like those associated with traditional education than with the requirements for job training. Professional education is a relatively long-term process involving multi-year programs initiated only after completion of an undergraduate collegiate curriculum. In contrast, job training, is a comparatively short-term process and has fewer academic prerequisites. Second, professional education is usually conducted in an academic setting located at or near a university. For these two reasons, we do not include professional education in our discussion of training contexts.

**Table I-1. Examples of Training Programs Inside and Outside  
Traditional Educational Contexts**

Type of Program	Traditional Education		Business	Military	Religion
	Public	Private			
<i>Degree Programs</i>	Colleges and universities	Colleges and universities	Corporate colleges, e.g., Wang Institute, RAND Graduate Institute	Military academies, e.g., West Point, Annapolis	Religious colleges, (e.g., Notre Dame)
<i>Certificate, Vocational/ Professional Programs</i>	Community colleges and vocational high schools	Private training schools	Company-run vocational programs	War colleges	Seminaries
<i>Non-degree Programs</i>	Adult education programs	Specialized training	Corporate training	Basic training	Church schools, catechism classes

**Note for Table I-1:** *Adapted from Scott and Meyer, 1994.*

## **B. ORGANIZATION**

The remainder of this document describes contexts that further define and distinguish among different types of job training. Section II provides a discussion of historical and conceptual contexts of job training. Section III describes some of the more important contexts for contemporary job training in the United States. Section IV provides some conclusions based on our discussion,

## **II. HISTORICAL AND CONCEPTUAL CONTEXTS**

To understand contemporary contexts for job training, it is helpful to know something about the historical and conceptual background for training in the United States.

### **A. ORIGIN AND EARLY DEVELOPMENT OF TRAINING IN AMERICA**

Training and education in America trace their origin to the same place: the household. While schools separate from households were established soon after the Plymouth colony was founded, most children received reading and writing instruction in their homes. Similarly, the colonial farm and the shop were contained within the household, and there the children acquired the skills of the farm or the shop. The family was responsible for ensuring that children acquired the skills that they would need to provide for themselves and their families. In the early years of the American colony, training was generally not gained from books or learned through any formal means. Rather, the content of the training was transmitted through an oral and experiential, or learning-by-doing, format.

#### **1. 17th and 18th Centuries**

As Cremin indicates, mothers and fathers were the trainers in colonial America.

In a subsistence economy, this meant at the very least that boys would be instructed by their fathers in the multifarious arts required for the management of the household, farm, and shop, while girls would be similarly instructed by their mothers. For those who wished to follow some calling not pursued in their own homes, it meant apprenticeship in another household, where the new mystery or art would be systematically taught by a parent surrogate (Cremin, 1970, p. 133).

With regard to agriculture, Indians also played a role as trainers for the early settlers as they attempted to contend with the conditions of the New World. Indians taught the immigrants the cultivation of maize and tobacco, using farming techniques that were better suited for the cheap and virgin American soil than the farming practices that were appropriate for the valuable and relatively exhausted English soil of the homeland (Cremin, 1970).

Apprenticeship became an increasingly important form of training as the American workplace became more urbanized and demanded higher skill levels. The English system of apprenticeship had developed over 3 centuries and was codified in 1563 with the Statute



of Artificers. This statute set the apprenticeship period as 7 years and defined the rights and responsibilities of masters and apprentices. In the American colony, the labor shortage led to more leniency in the apprenticeship system. Young boys were often apprenticed earlier and ended their apprenticeship in less than the stipulated 7 years. Thus, access to the trades in America was considerably easier than it had been in England (Cremin, 1970). In early America, as had been the case in England, the responsibility of the master to his apprentice went beyond training in a skill and included the teaching of reading (Welter, 1962).

The issue as to whether a child would receive training as an apprentice was a subject of law in the colonies. In Virginia, a law enacted in 1631 authorized officials to take children from parents who could not properly support them and to bind them over to a master where they would receive training. In Pennsylvania, William Penn's (1644–1718) "Second Frame of Government" in 1682 called for all persons of 12 years to be "... taught some useful trade or skill, that the poor may work to live, and the rich, if they become poor, may not want" (Welter, 1962).

Books represented another means of training in the early America. By 1762, all 13 colonies had at least one press, and there were a total of 40 presses in the country. The growth of printing resulted in a considerable volume of books. Some of these were books were resources for acquiring knowledge of agriculture and other trades. For example, the *American Instructor*, published in 1748, was an encyclopedia that covered topics such as elements of bookkeeping; principles of measurement for carpentry, joinery, and brick-laying; and business form letters, models of invoices and receipts, and rudiments of arithmetic—among other sundry subjects (Cremin, 1970).

As cities became larger, proprietary schooling for those interested in acquiring a marketable skill became more available. Private schools were generally headquartered in the home of the teacher. Instruction was arranged to accommodate the availability of the teacher and the students. Often, the instruction was provided in the evening. Some private schools provided boarding. Advertisements from Boston newspapers reveal that numerous proprietary schools covered a wide range of topics. One such advertisement, which appeared in a Boston newspaper in 1720, is typical:

AT THE HOUSE formerly Sir Charles Hobby's are taught Grammar, Writing after a free and easy manner, in all hands usually practiced, Arithmetick Vulgar and Decimal in a concise and Practical Method, Merchants Accompts, Geometry, Algebra, Mensuration, Geography, Trigonometry, Astronomy, Navigation and other parts of the Mathematicks,

with the use of Globes and other Mathematical Instruments, by Samuel Grainger.

Those whose Business won't permit 'em to attend the usual School Hours, shall be carefully attended and instructed in the Evenings (Edwards and Richey, 1963, p. 110).

As schools began to proliferate in the colonies, one of the popular types was the Latin grammar school. In a sense, this was a secondary school since entering students were expected to have mastered the rudiments of the reading and writing; yet, the system of articulated elementary and secondary schools with age grading and sequential curriculum did not emerge until the middle of the 19<sup>th</sup> century. The Latin schools existed to provide the preparation required to secure entrance to colleges. The curriculum concentrated on study of Latin and Greek, which were prerequisites for study in college.

In 1749, Benjamin Franklin (1706–1790) presented his *Proposals Relating to the Education of Youth* in Philadelphia. This document outlined a plan for a new type of secondary school that would be quite different from the Latin school. Franklin claimed that the school he proposed, which he called an “academy,” would teach students

. . . everything that is useful, and everything that is ornamental: but art is long, and their time is short. It is therefore proposed that they learn those things that are likely to be most useful and most ornament, regard being had to the several professions for which they are intended (Cremin, 1970 pp. 375–376).

In effect, Franklin created the prototype for a comprehensive high school with a strong vocational flavor. The curriculum included academic content, such as history, ethics, literature, and rhetoric, but it also included history of commerce, principles of mechanics, visits to farms, and other practical subjects. Franklin contended that those instructed at these “academy” schools would enter the world “. . . fitted for learning any business, calling or profession, except such wherein languages are required.” They would be qualified “. . . to pass through and execute the several offices of civil life, with advantage and reputation to themselves and country” (Cremin, 1970, p. 376).

The American army, unlike its European counterparts, was not a professional military force. Rather, American citizens served in local military units on a temporary and short-term basis in response to immediate needs, such as Indian raids. These local organizations were modeled on the principle of the Saxon fyrd that required every able-bodied man to train periodically at his local site of government to keep himself prepared for any emergency (Coakley, 1988a). An alternative, purely voluntary military organization also evolved in America. Like the militia, these volunteer organizations trained and served only

on a short-term, part-time basis. Typical training topics for the militias and volunteers included weapons employment and battle drills adapted from European militaries. Officers in these organizations were not trained in formal military schools; rather, they attained their status through influence or wealth. By the end of the 18<sup>th</sup> century, the experience of the American Revolution indicated the need for a full-time professional corps of enlisted and officer personnel who used standardized training practices. Nevertheless, the colonial legacy of the citizen-soldier has endured, as evidenced by the continuing reliance of the United States on part-time Service personnel, trained at local units, to provide a substantial portion of the manpower required to defend the nation.

Thus, by the end of the colonial period, job training was conducted in several venues. The dominant means of furnishing training was still in the homestead and shop and employed mainly “on-the-job” or apprentice training methods. In urban areas, proprietary schools were another important form of training available to those who could pay for it. Self-instructional training was available in the form of books, almanacs, and manuals. Finally, but to a considerably greater extent, vocational training was available in schools similar to Franklin’s Academy.

## **2. 19th Century**

The 19<sup>th</sup> century was a period of rapid growth and profound change in the United States as the character of the nation became increasingly urban and industrial. With industrialization and a shift of the workplace from the home to the factory, training was required to use equipment and to follow procedures that were indigenous to the factory or business place.

The years at the middle of the 19<sup>th</sup> century were years of important developments for schooling in the United States. During that period, the American Public School—or as it was often called by its founders, the Common School—was established. Horace Mann (1796–1859), Henry Barnard (1811–1900), and the other founders of the Common School did not emphasize vocational skills. Rather, they focused on the establishment of schools for young children. The purpose of the schools centered on providing social and political stability.

During the 19<sup>th</sup> century, several actions taken by the Federal government and the establishment of several other organizations made important contributions to agricultural training. In 1862, the United States Congress passed the Morrill Bill. This version of the bill, which was passed by Congress and signed by President Lincoln, was similar to a version of the same legislation that had been passed by Congress in 1857. The 1857

version, however, was vetoed by President Buchanan on the grounds that it violated state rights and established a dangerous precedent of federal aid to education.

The Morrill Bill provided grants of public land to states to establish, in each state,

... at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning, as are related to agriculture and the mechanical arts (Good and Teller, 1973, p. 277).

The "land-grant colleges" created by the Morrill Act emphasized agriculture, industrial, and military arts in their curriculum. This act and another Morrill Act in 1890 led to the establishment of 69 land-grant colleges throughout the United States, with at least one such college in each state. The land-grant colleges became a particularly strong factor in fostering agricultural research and development (R&D) and in substantially improving the training of farmers. In 1887, the U.S. Congress enacted the Hatch Act. This act provided for agricultural experiment stations in connection with the land-grant colleges and for dissemination of the findings from these experimental stations to farmers. Around the same time, the Grange, the Farmers' Union, and farm bureaus were organized. These organizations had very active programs involving the dissemination of information and techniques to improve farming. For example, the Grange included lectures by a members of the local Grange and presentations by other members on particular topics (Knowles, 1994). At the heart of all these developments was the recognition that agriculture had become very technical and that simply relying on a father to hand down this craft to his son was not wise (Nadler, 1979).

Although the trade union movement began shortly after the Civil War, the involvement of trade unions during their early years of industrial development was minimal. Trade unions would not become a major factor in worker training until well into the 20<sup>th</sup> century. Among the first of the trade unions to address worker training was the International Ladies Garment Worker' Union, which established a permanent worker education department in 1916. The Amalgamated Clothing Workers' Union established a similar department 3 years later. Of course, during the later years of the 19<sup>th</sup> century and into the 20<sup>th</sup> century, the need for low-cost, untrained labor was still considerable. Much of the mission of trade unions was to protect such persons since they could be replaced easily with little loss in training investment or with little OJT for those who would replace them.

Factory schools emerged in the latter part of the 19<sup>th</sup> century. These schools were training departments that were created to produce a work force for a particular employer. One of the earliest of these was the Hoe and Company factory school, a manufacturer of

printing presses, that began in 1888. The Hoe and Company was faced with a strong demand for their printing presses. The apprenticeship system was inadequate to supply the number of machinists needed for this increased production, and, as a result, the company established a factory school to expedite the development of this work force. The Westinghouse Company established a factory school in 1898. Other companies, such as General Electric, Baldwin Locomotive, International Harvester, Western Electric, Goodyear, Ford, and National Cash Register, installed factory schools in the early years of the 20<sup>th</sup> century (Miller, 1987).

The factory school was, in fact, one of the earliest forms of a Human Resource Development (HRD) department for a firm. Unlike a contemporary HRD department, the emphasis of the factory school was on worker training in entry-level skills. Nadler (1979) points out that continuing training received little focus because implying that additional training was needed would cast doubt on the craftsmanship of workers.

Organizations played an important role in providing opportunities for person to receive training. Chapters of the Young Men's Christian Association (YMCA) provided training to enable persons to compete for higher level and better paying jobs. In 1892, the Brooklyn YMCA offered a course in freehand drawing, and the Springfield, Ohio, YMCA provided courses in patternmaking, toolmaking, and cabinetry. In 1905, the West Side New York YMCA offered 63 courses, most of which were commercial, industrial, or scientific. Other organizations, such as the Chautauqua Literary and Scientific Circle, made a strong contribution to the amount and quality of instruction available in sites served by Chautauqua. In 1884, Cooper Union in New York began evening vocational courses (Craig, 1987).

It was not until the adoption of the Constitution in 1789—eight years after the end of the Revolutionary War—that United States established a permanent national military establishment. A new, full-time professional (or “Regular”) Army was established, in part, to address training deficiencies that became evident during the Revolution. Although the Regular Army gradually grew in size and influence throughout the 19<sup>th</sup> century, most of the military units continued to be part-time militias and volunteer units. These militias/volunteer units continued to provide training locally on a part-time basis, just as they had in the 17<sup>th</sup> century. According to the Constitution, neither the U.S. Congress nor the President had control over the training of these state-run units; however, the Congress did prescribe that militias use the system of field exercises developed by General von Steuben, a Prussian officer who served under Washington during the American Revolution. His

program emphasized formation and movement drills, proper care of equipment, and use of the bayonet (Coakley, 1988b).

The United States Navy was a new military organization in the 19<sup>th</sup> century. The Continental Congress formed a small navy in 1775, but it was demobilized in 1785 because of a lack of funds. A permanent navy was established in 1798, with the founding of the Navy Department. For most of the 19<sup>th</sup> century, enlisted sailor training was conducted shipboard according to apprenticeship methods similar to those used in the civilian sector.

During the 19<sup>th</sup> century, the most important innovation in military training was the establishment of institutions for formal officer education. In 1802, the first such institution, the U.S. Military Academy at West Point, was established under the supervision of the Corps of Engineers. The U.S. Naval Academy was established in 1845 in reaction to an apparent mutiny attempt in 1842 on board the *Brig Somers*, a school ship for training teenage volunteer apprentices. The Morrill Act of 1862 also established courses of instruction in military arts and sciences at land-grant colleges. In 1866, a congressional act that fixed the organization of the Army authorized the President to detail as many as 20 officers to teach military science in all institutions of higher learning. These two acts became the basis for the Reserve Officer Training Corps (ROTC), which in the 20<sup>th</sup> century became the main source of commissions for the U.S. military. During the 19<sup>th</sup> century, the first of formal institutions were established to train intermediate- and senior-level commissioned officers: the Army's School for Application of Cavalry and Infantry<sup>1</sup> at Fort Leavenworth, Kansas, in 1882; and the Naval War College in Newport, Rhode Island, in 1884.

### 3. 20th Century

Conditions of American life in the 20<sup>th</sup> century spurred the formation of additional venues and approaches for training the American worker. World War I was a truly global war and required the mobilization of U.S. military on an unprecedented scale. For instance, over one million American troops organized in nine divisions were committed to the fight in Europe. Civilians were initially trained in the U.S. for 4 months and then sent to France for additional training from their receiving divisions. Special training centers were set up for topics such as gas warfare, demolitions, and the use of the hand grenade and the mortar. General John J. Pershing, the U.S. Army Chief of Staff, set up these

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<sup>1</sup> This intermediate course later evolved into several officer training programs, including today's Army Command and General Staff College, which is still in existence at Fort Leavenworth.

programs with courses and materials, making sure that they were standardized across the force (McDonald, 1988).

The mobilization of industry during World War I also prompted the need for more civilian worker training. In 1917, the Emergency Fleet Corporation of the United States Shipping Board created an education and training section. There were 61 shipping yards in the U.S. employing 50,000 workers, and there was a critical need for 10 times more workers. Since the supply of trained personnel could not meet the demand, the only course available to meet the demand was to train new workers.

The Smith-Hughes Act of 1917 provided subsidies for vocational education in public high schools. It provided support for training teachers who taught subjects such as home economics, agriculture, and vocational education. It also established the Federal Board for Vocational Education, which awarded funds to the states. This act required each state to establish a State Board of Vocational Education, which was required to submit the state plan for approval to the Federal Board. When those supporting the Smith-Hughes legislation began their efforts, the emergence of a separate secondary vocational training system—distinct from the existing secondary schools—was a possibility. However, vocational training under the Smith-Hughes act was included in the existing high schools.

Just as these new venues for training were becoming established, the Depression of the late 1920s and early 1930s increased the supply of surplus workers and enabled employers to find an ample supply of skilled workers, thereby reducing the need for employer-furnished training (Nadler, 1979). The New Deal legislation of the Roosevelt administration in the mid-to-late 1930s did provide training for people who were given work under the aegis of various agencies established during this period, such as the Civilian Conservation Corps and the National Youth Administration.

In the face of growing tensions before World War II, the U.S. military drew up extensive mobilization plans. These plans provided a detailed blueprint for training, including the size, location, and scheduling of replacement/unit training centers and unit/individual training programs and materials. In September of 1940, Congress enacted the Selective Service and Training Act, which represented the first peacetime draft of untrained civilians. Sadly, planners underestimated the personnel and training needs of World War II, which required more than twice the number of soldiers and sailors than World War I. By 1944, General George C. Marshall's plan for an orderly and centralized training process was quickly undermined by a critical need to provide replacements. As the war exacted its toll in casualties, training suffered from shortages in personnel, equipment,

and noncommissioned officers (NCOs), who normally provided much of the training and leadership in the Army (Matloff, 1988).

World War II greatly expanded the need for civilian worker training because the war effort intensified industrial production and the military mobilized to provide the vast numbers of people with the skills needed for the war effort. During this period, the American Society of Training and Development (ASTD) was founded. The establishment of ASTD represented a recognition of training as a formalized entity with its own set of professional standards (Keaty, 1956).

## **B. THEORETICAL AND RESEARCH CONTEXTS**

As discussed previously, training practices in the United States have evolved over the years. The theoretical and research concepts that underlie the modern practice of training are relatively new developments—most dating to the present century. These relatively recent developments can be divided into those occurring in the early, middle, and late periods of the 20<sup>th</sup> century.

### **1. Early 20th Century**

The turn of the 20<sup>th</sup> century saw some remarkable developments in research methods and findings related to human memory (Ebbinghaus, 1885/1913) and to animal conditioning and learning (Pavlov, 1927). Despite the potential application of this work to job training, researchers in the first part of 20<sup>th</sup> century were generally reluctant to apply laboratory findings to practical problems in the classroom and on the job (Bugelski, 1964). Exceptions to this generalization were two educational theorists, who were active in the late 19<sup>th</sup> and early 20<sup>th</sup> century. These two men have had a lasting effect on modern theory and practice related to training.

#### **a. John Dewey**

John Dewey was born in 1859 in Burlington, Vermont, and received his undergraduate degree from the University of Vermont in 1879. In 1884, he received his doctorate in philosophy at Johns Hopkins University. He started teaching at the University of Michigan and later at the University of Minnesota. In 1894, he moved to the then recently established University of Chicago, where soon thereafter he founded the Dewey School, now known as the Laboratory Schools of the University of Chicago. In 1904, he accepted a position at Columbia University in New York and started work as Professor of



Philosophy in 1905. He remained at Columbia for the rest of his career, retiring in 1930 but remaining associated with the university as Professor Emeritus until his death in 1952.

Dewey is widely regarded as the father of the progressive movement in education. As a proponent of the philosophy of instrumentalism (a form of pragmatism), Dewey held that truth has no transcendental or eternal reality; rather, truth is an instrument used by human beings to solve problems. Therefore, the truth changes as problems change. The learner actively seeks solutions to these problems and gains valuable knowledge and skills from the process. From this philosophical point of view, Dewey argued that learning must be grounded in the context of real-world problems. Furthermore, students should address these problems as “natural wholes” rather than artificial parts imposed by teachers. This point of view was the theoretical foundation for the “project method” of instruction (e.g., Kilpatrick, 1918) wherein students learn scientific and technical facts and methods by collaborating with others to solve complex, real-world problems. The project method of instruction has gained wide acceptance in elementary education, science instruction, and agricultural education and has had a particularly pervasive impact on industrial arts and technology education (e.g., Clark, 1989; Knoll, 1997). Dewey’s emphasis on learning from practical experience (“learning by doing”) has had a profound effect on both training and education in general.

Dewey’s emphasis on real-world experience and problem-solving enhanced the status of knowledge and skills associated with job training (or “manual training” in his terms) to a level equivalent with the more “intellectual” knowledge and skills associated with traditional academic subjects. Although Dewey argued that the content of manual training (as well as academic instruction) must address real-world problems, he maintained that the proper context for manual training is the formal primary and secondary school system. According to Dewey, the purpose of all forms of education is to prepare students for life in a democratic society by having them engage in social life. Dewey likened his experiential approach for learning to experimentation in the scientific sense. Further, he consistently maintained that students should learn and apply knowledge and skills related to the scientific method. Despite his respect for the scientific method, his educational thought is grounded more in philosophy than in empirical research.

#### **b. Edward Lee Thorndike**

E. L. Thorndike was born in Williamsburg, Massachusetts, in 1874. He completed his bachelor’s and master’s degrees at Harvard University, studying with William James. He subsequently transferred to Columbia University to start his doctoral training in

psychology, which he completed in 1898. He immediately started his professional career at Teachers College of Columbia University and retired there in 1940. He died in 1949.

His early work, including his graduate work, focused on animal learning. His typical research apparatus housed animals (typically cats) in a box that afforded a view of reward, such as food. The reward could be obtained only if the animal acted to release itself from confinement. Detailed observation and analysis of behavior led Thorndike to conclude that the animals behaved by trial and error rather than by reason or insight. The primary mechanism through which learning occurs is summarized in his "law of effect," which holds that learning depends on the consequences of behavior. If a behavior is followed by a "satisfying state of affairs," the probability of that behavior recurring is increased. Although Thorndike's original research was on animals, subsequent work on humans showed similar results—and this convinced him that his mechanistic concepts of behavior applied to humans as well as animals.

Thorndike was a prolific writer, and his work had a significant impact on modern psychology and education. His theory of transfer, developed with Robert Woodworth (Thorndike and Woodworth, 1901) early in his research career, has had a particularly large effect on training. This theory held that the amount of learning successfully transferred from one situation (e.g., practical exercises) to another situation (e.g., performance on real-world tasks) depends on the number of "identical elements" that the two situations have in common. Thus, transfer is always specific and never general. Thorndike's identical elements theory has had a significant effect on theories of learning and on the practice of simulator construction and implementation (e.g., Hays and Singer, 1989).

Thorndike's behavioristic conception of education is often contrasted with Dewey's cognitive interpretation. However, many of Thorndike's prescriptions for job training and instruction were remarkably similar to Dewey's, although the two differed on their descriptions of the processes that underlie learning. Both were advocates of active problem solving as an important approach for learning complex tasks, although Thorndike's mechanistic interpretation of problem solving differed substantially from Dewey's more mentalistic approach. Both argued for practice under real-world conditions, but Thorndike's argument was based on his "identical elements" theory of transfer, whereas Dewey's stressed the importance of providing experience on natural "whole" tasks. Finally, both raised the status of job training by arguing against the supremacy of academic subjects in education. Thorndike agreed with Dewey that practical skills taught in industrial arts and technology course are at least equal if not more important than traditional academic topics, such as mathematics and languages.

Thorndike differed from Dewey in his reliance on empirical research. In contrast to Dewey, Thorndike continued active empirical research throughout his career. In fact, his research findings led to a major reformulation of his theories in 1930, softening many of the hard-core behavioristic concepts he had developed in the early part of his career. The emphasis on active empirical research in current training development and evaluation is, at least, partly attributed to Thorndike's legacy.

## **2. Middle 20th Century**

The middle period of the 20<sup>th</sup> century, starting just before World War II and continuing into the 1970s, gave rise to two new theoretical frameworks: modern behaviorism and systems theory. Both of these frameworks continue to affect training today.

### **a. Modern Behaviorism**

The early behaviorism of Thorndike was elaborated by several researchers who carried on active programs of research and theoretical development in the 1930s through the 1960s. In its most extreme form, radical behaviorism (e.g., Skinner, 1938, 1953) asserted that learning could be completely explained by the relationships between external stimuli and overt responses, without recourse to any unobservable mechanisms of any sort. Neobehaviorism (e.g., Hull, 1943; Spence, 1956), in contrast, allowed the specification of unobserved intervening variables and hypothetical constructs, but the nature of these theoretical elements remained strictly mechanical and non-mentalistic. Although behaviorism held sway during the middle part of the century, it nevertheless had detractors during this period. Tolman (1932, 1951) argued that behavior is integrated and cannot be explained without reference to a unifying purpose. Despite his objections to theoretical behaviorism, Tolman remained a methodological behaviorist in that he believed that his cognitive theory could only be confirmed by reliance on objective and observable performance rather than on subjective experience.

Behaviorism has left a lasting effect on modern training practices. One of the more influential applications of behavioristic learning theory to training technology has been Mager's (1962) concept of behavioral objectives. Mager held that training development should begin with the identification of behaviorally defined training objectives, which provide a clear description of instructional intent (Pipe, 1975). By "behaviorally defined," Mager meant that each objective must describe the to-be-learned task(s) in terms of three essential components:

1. The observable behavior that the learner must perform to demonstrate mastery of the objective
2. The stimulus conditions under which the behavior should be observed
3. The criteria of success that objectively define competent performance.

The specification of training content by behavioral objectives is now regarded as a core concept in training development and practice.

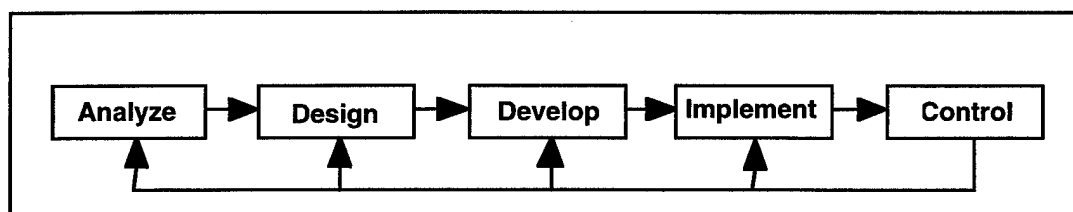
Although Mager and others have worked to translate behavioristic learning theory into training practice, the theorists did not always approve of applied training research. For instance, the neobehaviorist Spence (1956) seemed to resist actively the research in training and education when he asserted that “. . . too much of the time and energy of too many psychologists is currently being spent on engineering rather than basic, scientific problems” (p. 23). The radical behaviorists (i.e., Skinnerians) appeared to be a bit more sympathetic toward applied research. However, their work tended to focus on highly controlled experimental training situations imparting relatively simple content (e.g., programmed learning) as opposed to less controlled field training situations where topics are more complex (e.g., classrooms education or OJT).

### **b. Systems Theory**

Systems analysis is a multi-disciplinary approach for describing and predicting the performance of complex real-world phenomena. Publicly introduced by Ludwig von Bertalanffy in 1937 in a lecture at the University of Chicago, systems theory was originally presented as a theoretical approach to integrating knowledge in the biological sciences. According this theory, organisms could be explained as a hierarchical organization of black-box processes, taking input from their environment and giving output back to their surroundings. Although originally developed for biological phenomena, it was evident to von Bertalanffy and others that any complex phenomenon could be analyzed into multiple interrelated parts. However, each system (or subsystem) retains its unity or wholeness because the parts and relations share a common goal. Kenneth Boulding (1956) was one of the first people to elaborate on von Bertalanffy's ideas with ideas from cybernetics and information theory to begin the development of systems engineering technology. Von Bertalanffy (1968) later expanded his own notions into what has become known as General Systems Theory, which applies to physical sciences (e.g., biology, physics, and chemistry) and to the social and behavioral sciences (e.g., psychology, economics, and management science). It has also been used to address a variety of complex practical problems

in civilian manufacturing, manned space flight, and computer hardware and software design.

Starting in the 1960s, several training researchers began to recognize the relevance of systems analysis to the complex process of implementing training (e.g., Crawford, 1962). In a system's view, the training problem is typically analyzed as phases or components that influence or interact with one another directly or indirectly. For instance, the systems model developed at the Center for Educational Technology at Florida State University (FSU) (Branson, et al., 1975) identifies five such phases: analyze, design, develop, implement, and control. The control component of the FSU model provides an evaluation function that feeds back to the other components (see Figure II-1). The initial analysis component of this model starts with an explicit identification of the systems objectives; thus, Mager's concept of behavioral objectives was a natural fit and was quickly incorporated in this systems model and many others. Since the 1960s, several different systems approaches to training development have evolved and have become a subject of study unto themselves under the rubric Instructional Systems Development (ISD). However, no single model has emerged as the definitive version of ISD. In fact, Goldstein commented in 1980 that "...there are almost as many systems approaches as there are authors on the subject" (p. 231). If anything, however, the number and variety of ISD concepts attest to the lasting effect that systems theory has had on instructional design.



**Figure II-1. Depiction of the FSU Instructional Systems Development (ISD) Model**

**Note for Figure II-1:** Taken from Branson, et al., 1975.

### **3. Late 20th Century**

In the 1960s and 1970s, just as behavioristic learning theory was peaking in its influence on training research and practice, learning theorists were becoming increasingly dissatisfied with behavioral conceptions of learning and memory and increasingly interested in the study of internal knowledge structures and cognitive processes that underlie task performance. The rise of cognitive interpretations of learning and memory was viewed by

some as a revolution in theoretical models and research paradigms (e.g., Neisser, 1967). Others, however, have viewed cognitive learning theory as a less dramatic evolutionary shift from how learning occurs to what is learned (Greeno, 1980). Although researchers debate the perceived extent of change, no one denies that cognitive theory is now the dominant theoretical viewpoint in research on learning and memory. It is just now having an effect on training research and practice, as indicated by at least two notable trends:

1. The greater use of mental constructs to define task requirements (i.e., through so-called "cognitive tasks analysis" methods)
2. The greater willingness to devise training interventions for mentally demanding tasks (e.g., medical diagnoses, military tactical planning, and air traffic control).

Along with the theoretical shift brought on by cognitive psychology, there has also been a noticeable shift in research strategy. Behavioristic theories were concerned with general laws of learning derived from the analysis of simple situations under artificial but controlled conditions. For behaviorists, representative research tasks were paired associate learning or free recall. Some cognitive researchers have argued that such knowledge-lean tasks fail to demand complex cognitive processes that characterize real-world task performance. Thus, cognitive researchers typically research more knowledge-rich tasks, such as chess performance, algebra problem solving, and reading from text. Unfortunately, the theories of learning based on specific types of problems lack generality. Glaser (1990) reviewed then-recent cognitive research and lamented that the learning processes and instructional implications discussed in these studies showed few commonalities across the task domains. He remained confident, however, that an integrated theory would eventually be designed to prescribe a mix of instructional approaches for specific training purposes. Unfortunately, such an integrated theory has not yet emerged.

At the same time, this shift in research strategy has clearly created a more conducive atmosphere toward empirical training research. Unlike the neobehaviorists, contemporary researchers show a greater willingness to tackle real-world training problems, such as those in Air Force technical skill training (Glaser et al., 1986) and air traffic control (Means et al., 1988). However, whether cognitive learning theory leads to significant breakthroughs in training practices remains to be seen.

Despite these noticeable shifts in theory and research strategy, training researchers seem intent on retaining some of the advances from previous eras. Clearly, training researchers continue to endorse (explicitly or implicitly) a methodological behaviorism that

stresses the importance of objective, observable performance as the primary indicator of training output. The concept of behavioral objectives also continues to serve trainers well as a method for defining the content of instruction. Wells and Hagman (1989) have also demonstrated that objectives have a positive effect on learning at the individual level. However, it is interesting to note that explanations for the positive effects of behavioral objectives are now cast in cognitive terms (e.g., Hartley and Davies, 1976). Similarly, ISD continues to be a helpful process for developing training, although the learning processes are typically discussed in cognitive rather than behavioral terms (Tennyson, 1995). Also, systems analysis has evolved into a more general viewpoint in training. Originally, it was viewed as a tool for training development, but it is now seen as a more general method for understanding training as a key component of organizational development and performance (e.g., Senge, 1990).

### **III. CONTEMPORARY TRAINING CONTEXTS AND VENUES**

The complexity of training in America has steadily increased over the past three centuries. Early in the history of the United States, the prime venue for the American workplace was the home. Now, training is provided in multiple venues under the aegis of many diverse organizations. The home, ironically, is re-emerging as an important site for training as provided by the Internet and the World Wide Web.

After performing an initial review of diverse training contexts, we concluded that a marked distinction exists between the contexts for military and civilian training. Although the training methods for these two contexts are not that much different, other considerations led us to describe these types of contexts separately. Perhaps the most striking difference was that the amount of information on military training was much larger than the amount in any single civilian training context. This disparity arises in part because military is the largest "single employer" trainer in the United States. Furthermore, this single employer is obliged by its board of directors (i.e., the U.S. Government) to provide the public detailed information on training. In contrast, civilian training is characterized by its wide diversity of employers. Because many of the civilian organizations are in competition with one other, many training methods and materials are proprietary in nature. Civilian employers are not routinely obliged to collect training information, much less provide it to the public.

Another key difference between military and civilian training, according to some, is that the emphasis on training is higher in the military than it is in the civilian world even though the number of civilian workers is much larger than the number of military personnel. Military Service personnel devote a larger portion of working hours to training than their civilian counterparts simply because the opportunities for performing their primary function (making war) are thankfully rare. Some have estimated that military Service personnel devote as much as 80 percent of the time spent on the job to training. In contrast, civilian workers spend much less time in training. They, instead, focus on executing their primary job functions. Because of this cultural difference in the emphasis on training, instructional methods and technologies are more structured and codified in the military training contexts.



Because of these differences, we split our descriptions of contemporary training contexts into subsections on military and civilian training. The section on military training describes subcontexts or venues that pertain to this category, along with other distinguishing characteristics of military training. To examine civilian training, we looked at contexts that apply to a wide spectrum of industries, businesses, and service organizations. Sometimes, the information for particular training contexts—particularly those in the civilian sector—was particularly sparse (e.g., distance learning). Bear in mind that the amount or diversity of information that we report on military and civilian contexts is not meant to indicate the relative importance or extent of training that is currently being conducted in these training contexts.

## **A. MILITARY TRAINING**

Military organizations have been pioneers in the development of modern job training methods and technologies. Their leadership has been largely born from necessity. During periods of national conflict, military Services must train—often in a short period of time—large numbers of men and women, most of whom have little or no background knowledge of or skill in performing military tasks. Although the end of the Cold War has resulted in budget and force structure reductions for most military organizations, the Persian Gulf War showed the necessity for the world's military organizations to be prepared to conduct large-scale conventional warfare. Also, in the post-Cold War world, military organizations have undertaken new missions, such as peacekeeping and drug interdiction. As a result, some military organizations are conducting operations at a higher tempo than they were during the Cold War. Despite reductions in international tensions brought about by the end of the Cold War, military organizations must still train their personnel efficiently and effectively.

The following description pertains to the U.S. military training establishment. Although this establishment is larger than those of most nations, the methods and practices used by the U.S. military represent the norm for most large and modern military establishments and a model for smaller and developing establishments.

### **1. Individuals to be Trained**

The most fundamental distinction in the military population is that between the enlisted and officer corps. This distinction affects nearly all aspects of military life, including training. Enlisted soldiers, including their NCO leaders, perform much of the

specialized job functions in the military. Consequently, their training tends to be focused more narrowly on those job functions. In contrast, officers require a broader knowledge base to employ multiple and diverse enlisted personnel and other officers in a concerted and synchronized warfighting effort. Although officer training includes some job-specific knowledge and skills, it stresses more general topics, such as military tactics, strategy, and leadership.

## **2. Training Venues**

The context for military training can be subdivided into several subcontexts or “venues.” Gorman (1993) maintained that four such venues could be identified by the combination of two binary distinctions: where training occurs (in a military training institution or in the unit) and who is trained (individuals or collectives). Table III-1 identifies each of these four training venues and provides a non-exhaustive list of examples that typify each.<sup>2</sup>

With regard to the horizontal dimension in Gorman’s taxonomy, institutional training is defined as that where students typically travel from their home station to a permanent physical facility that has a fixed instructional faculty and curricula. Unit training, in contrast, occurs at home station where the population is fixed (unit personnel), but uses the unit’s resources (faculty, facilities, and curricula), which are often not fixed (Gorman, 1990). This distinction has an important implication for determining training costs. Determining the costs of institutional training is easy because most of these fixed costs (including student travel and subsistence costs) are a matter of record. For instance, the appropriated funds for individual training for Fiscal Years (FYs) 1998 and 1999 were \$13.8 billion and \$14.0 billion, respectively (Department of Defense, 1998b). In contrast, the cost of unit training is more difficult to determine because it typically comes from the unit’s operating and maintenance (O&M) budget, which is also used for base operations, maintenance, and security. The unit commander has considerable discretion in allocating

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<sup>2</sup> A fifth military training venue is just evolving—that provided by distance learning technologies. This new approach to military training does not fit well into this four-category scheme because it combines features of institutional and unit training. Despite the interest in this evolving training context, it does not currently account for a significant portion of the military training load. This training venue is discussed as a separate context for training later in this document.

**Table III-1. Military Training Venues, With Examples From U.S. Armed Services**

Training	Where Training Occurs	
	Institution	Unit
<i>Individual</i>	<ul style="list-style-type: none"> <li>• Recruit training</li> <li>• Officer acquisition training</li> <li>• Specialized skill training</li> <li>• Flight training</li> <li>• Professional development education</li> </ul>	<ul style="list-style-type: none"> <li>• OJT</li> <li>• Self-paced individual instruction (e.g., computer-based instruction, video tapes) offered in learning centers</li> <li>• Ad hoc formal instruction on selected topics (e.g., map reading, sexual harassment)</li> </ul>
<i>Collective</i>	<ul style="list-style-type: none"> <li>• Army's Combat Training Centers</li> <li>• Air Force's RED FLAG Exercises</li> <li>• Navy's TOPGUN Program</li> <li>• Navy's Strike University</li> <li>• Marine's Combined Arms Exercises</li> </ul>	<ul style="list-style-type: none"> <li>• Army's Training and Evaluation Program</li> <li>• Air Force's Aircrew Training Program</li> <li>• Navy's Training Readiness Evaluation Program for submarines</li> <li>• Marine's Marine Corps Training Exercise and Employment Plan</li> </ul>

O&M funds to meet his organization's immediate needs. As a result, determining the portion of the O&M budget that is allocated to training—before or after the fact—is difficult.<sup>3</sup>

The vertical dimension in Gorman's scheme refers to who is trained—an individual or a collection of individuals. The concept of individual training is relatively unambiguous. Individual training in units can take a variety of forms and focuses on the individual Service member.. The unfortunate common thread that runs through these various forms is that training is usually unstructured and undocumented (Gorman, 1990). The concept of collective training, in contrast, is less clear because the to-be-trained "collectives" vary widely from small teams comprising a few personnel to large military organizations formed by aggregating teams of teams and comprising thousands of personnel. The two dimensions in Table III-1 combine to form four distinct training venues.

<sup>3</sup> Orlansky et al. (1994) estimated that unit training accounted for almost 20 percent of the FY93 O&M budget. Assuming this proportion holds for FY98 O&M budget (\$93.7 billion), unit training would account for about \$18 billion of the funds. However, this estimated portion has been subject to some considerable discussion.

### **a. Individual Training Conducted in Institutions**

This form of military training most closely resembles traditional civilian education. Entry-level training addresses two discernable goals:

1. To acculturate the entrant to the military way of life, including training in military discipline and physical conditioning
2. To provide introductory training in the entrant's assigned military occupation.

Sometimes, these two goals are provided in a single entry-level course. Other times, these goals are addressed by two separate courses offered in close temporal proximity. Although most associate this venue with basic or entry-level training, individual training at institutions continues throughout the military Service member's career, including instruction for junior and senior commissioned officers and NCOs as their careers progress.

This is the category for which the U.S. Congress requires the most detailed statistics. For instance, the Department of Defense (1998a) calculates a statistic (annual training load) that describes the overall throughput of training in all four U.S. Military Services (Army, Navy, Marines, and Air Force). This statistic is mathematically defined as the

$$(\text{Number of Entrants} + \text{Number of Graduates})/2 \times \text{Course Length in Years} \quad .$$

In other words, training load refers to the density of military training as the total number of military personnel that one would expect to be in training at any point in the school year.<sup>4</sup> For FY 1999, the estimated annual training load for this category was 166,492 or about \$83,000 per student year (Department of Defense, 1998a, 1998b). Although some speculate that the cost of individual institutional training is less than unit training costs (see Footnote 3), the training requirement and budget for individual training in institutions is nevertheless sizable by any standard.

### **b. Individual Training Conducted in Units**

Military units conduct individual training for a variety of reasons. One such reason is that the initial training that Service personnel receive in the institution is not sufficient to ensure adequate performance on the job. One method of providing additional training required for job performance is through OJT. As the name implies, OJT is the method

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<sup>4</sup> The authors of the 1997 DoD document point out that this formula assumes a steady (i.e., linear) rate of attrition from the start to the finish of a course. This assumption is not always tenable; nevertheless, the training load statistic provides an easily calculated and interpretable summary of the density of training being carried out by the DoD.

where Service personnel, under close supervision, learn their jobs as they perform them. Semb et al. (1993) reviewed OJT practices in the U.S. Navy by surveying the NCOs who would provide this training. They found that whereas OJT is a prevalent form of training, NCOs receive little or no information or training on how to conduct OJT. Although the survey targeted Navy training practices, the authors felt that their findings also applied to OJT in the other Services and in the civilian sector.

For various reasons, Service personnel assigned to units also seek or are assigned individual study on specific job-related subjects. For instance, changes in duties may demand that individuals receive initial or refresher training on radiotelephone procedures. Individual, self-paced instruction on such common topics is often found in unit-maintained "learning centers." These centers are multi-media libraries where Service personnel can access, on an as-needed basis, job-related information delivered by various media, such as audio or videotape, computer program, or by conventional print-based media.

Finally, units find that they need to conduct training for groups of personnel in response to immediate and specific needs, such as conveying changes in equipment or preparing for collective exercises. Conventional classroom methods are often used to deliver this form of unit training.

### **c. Collective Training Conducted in Institutions**

This venue represents collective training controlled by a permanent faculty, located in permanent facilities, and conducted in accordance with a standard curriculum. With the relatively recent development of instrumented ranges, this venue has developed as the appropriate site for training advanced warfighting skills. In 1968, the first such facility, the U.S. Navy's TOP GUN Fighter Weapons School, was established at Naval Air Station (NAS) Miramar, California, to train selected aircrews in advanced air-to-air combat skills. According to its original concept, the TOP GUN program included a permanent faculty, including veteran pilots who flew aircraft that were modified to resemble the threat aircraft that were likely to be encountered in Vietnam (MiG-17s and MiG-21s) and who used appropriate Soviet tactics and techniques. The purpose was to provide realistic battle seasoning to fighter pilots. The improvements in fighter performance during combat in Vietnam supported the establishment of similar collective training institutions. One of the larger centers for collective training, at least in scope and in land area, is the Army's NTC, located at Fort Irwin near Death Valley, California. This installation trains brigade combat teams (about 3,000-5,000 personnel) in advanced land warfare techniques and tactics. Brigades

exercise these skills against a highly trained opposing force (OPFOR) using equipment (even uniforms) that resemble a Warsaw-pact threat regiment. All programs rely on high-technology techniques to simulate weapons effects. For instance, the NTC relies mainly on eye-safe lasers to simulate the effects of direct-fire weapons, thereby decreasing the need for human "umpires" required in war games used in the past.

The exact costs for this type of training are not fully documented because the unit undergoing training absorbs some of the costs. Although the extensive use of simulation reduces costs related to ordnance, these field exercises are costly events. U.S. Government support for this type of training is strong since it is widely assumed that such institutions are highly effective in training warfighting skills. In particular, knowledgeable experts have credited such training as being directly responsible for high levels of combat performance, such as improved aircrew performance in the latter stages of the Vietnam War, and for the overwhelming victory of ground forces in the Persian Gulf War.

#### **d. Collective Training Conducted in Units**

This venue represents the fundamental approach to training and maintaining unit readiness of military forces. A key aspect of this venue is that training is conducted using either the unit's actual equipment or high-fidelity simulations of the equipment, thereby allowing units to "train as they would fight." Like individual training in units, collective training is conducted by unit members and financed by the unit's O&M budget. Compared with the ad hoc nature of individual training in units, however, the collective unit training program is more structured. In that regard, functional groupings within the military Services (e.g., Army infantry, Navy subsurface forces, Air Force tactical aviation) have developed structured unit training programs that specify events designed to train collections from small teams (e.g., tank crews or aircrews) to larger collections of individuals (e.g., flight squadrons, ships, battalions).

Collective unit training programs face two major constraints (or "challenges" to optimists). The first relates to shortages of large spaces of air, land, or sea to permit combat maneuvers that are safe and do not significantly degrade the environment. The second pertains to the substantial training costs associated with fuel, parts, and ammunition. These constraints are often cited as primary reasons for conducting unit training with more and more with simulation technology. Indeed, simulators have been developed to address a variety of collective training needs, including combat training on land (e.g., the M1 tank Unit Conduct-of-Fire Trainer), and in the air (e.g., the Air Force's F-16 Unit Training

Device or the Navy's F/A-18 Unit Training Simulator). While the cost and training effectiveness of simulators is undeniable, some maintain that simulation training cannot, in principle, be as effective as practicing on the actual equipment that would be used in war. Recent advances in weapon system technology have offered a new solution: embedding simulation capabilities into the actual equipment—so called, embedded training technologies (Morrison and Orlansky, 1997). Embedded training technology also implies that units do not lose the capability to train with simulations when they are deployed, for extended periods, away from their home base and their simulation facilities.

### **3. Training Development**

As discussed earlier, ISD represents one of the most important contributions of systems theory to training. The military is one of the more active proponents of ISD principles and guidance. Perhaps the zenith of the system's approach to military training development was the publication of the Interservice Procedures for Instructional Systems Development (IPISD), compiled by Branson and colleagues (1975) at FSU specifically for the U.S. Military Services. The IPISD views training development as a five-phase process:

1. Analyze the job
2. Design instruction
3. Develop instruction
4. Implement training
5. Control the process through evaluation and revision.

The IPISD brought a systematic and disciplined approach to the military training development process. Included in this comprehensive, five-volume work are numerous explanations and demonstrations of IPISD procedures. The intent was to permit personnel who were not schooled in educational theory to understand and use the complex procedures described in the IPISD documents. The sheer magnitude of the work was also its greatest weakness because it requires significant time and resources from military training developers to implement properly. Because of this and other problems, military training developers rarely used IPISD exactly as prescribed (Vineberg and Joyner, 1980). Despite these problems, ISD has evolved and even proliferated as a general approach to training development in the military (Sicilia, 1993).

Of the many variations to ISD, two different overall philosophies can be discerned. The first is typified by the IPISD system. This can be described as a "bottom-up" approach to training development because it starts with a detailed analysis of the serviceman's job (either individually or in small collectives) to determine what has to be trained. Descriptions of training goals for higher echelons are then constructed from these lower order analyses of behavior. The second approach is represented by the Army's System Approach to Training (Department of the Army, 1995). This is a "top-down" approach because it starts with an analysis of a unit's missions and goals, which then determine which collective and individual tasks must be trained. Although the two approaches differ in their starting points, both share the essential qualities of ISD—that training development depends on analysis of training requirements, the specification of training objectives, and the systematic design/development of training products from those specifications. Furthermore, all ISD systems incorporate an evaluation component to provide feedback for revising training as needed.

#### **4. Training Media**

Military trainers use a variety of media to deliver instruction. In broadly defined terms, the military uses three categories of media: conventional instruction, computer-based instruction (CBI), and simulation.

##### **a. Conventional Instruction**

Conventional instruction refers to lectures, discussions, practical exercises, and remedial tutoring delivered by human instructors (Orlansky and String, 1981). This method of instruction is most often used in institutional instruction where the goal is not only to convey information, but also to provide role models for trainees as part of the military acculturation process. This is the traditional medium against which others are judged. In that role, it is often portrayed as a cost-inefficient method that requires professional instructors and extensive physical facilities. It is also usually characterized as an inflexible approach because classes of students proceed through the course at a fixed ("lock-step") pace. Conventional instruction has also been criticized as being unstandardized, uninteresting, and insensitive to learner demands; however, these criticisms apply only to the worst applications of conventional instruction and could apply to poor instruction on any medium. Experienced and knowledgeable trainers know that conventional instruction can be an effective method for delivering training, especially when instruction incorporates essential features, such as active practice with actual equipment ("hands-on" training);



performance evaluation; and immediate and frequent feedback. Also, platform instruction can be merged with other media (e.g., videotape, slide shows, and computer-mediated presentations) to increase interest and to standardize the content and pace of instruction.

#### **b. Computer-Based Instruction (CBI)**

The military was an early advocate of CBI, employing large mainframe computers and mini-computers. Examples include the Programmed Logic for Automatic Teaching Operation (PLATO) developed at the University of Illinois and Time-Shared Interactive Computer-Controlled Information—Television (TICCIT). Orlansky and String (1979) evaluated these and other CBI systems and found that CBI, compared with conventional instruction, typically produces equivalent levels of achievement in a shorter period of time. For a portion of the systems reviewed, cost data were available. Total savings to the military were calculated as time savings (computed in terms of Service member pay and allowances) minus the costs associated with implementing CBI. Even for these initial versions of CBI, the savings were impressively large.

The military is currently experiencing a new wave of CBI, spurred by the proliferation of powerful personal computers (PCs) and inexpensive media, such as compact disc read only memory (CD ROM) and other high-capacity removable storage devices. This multimedia form of CBI can be used in combination with distance learning to deliver training at remote locations and at their homes. Reviews of research on this new wave of multimedia training technologies (e.g., Allen, 1998; Fletcher, 1996; Hall, 1995) suggest that military applications share the following advantages with their civilian counterparts:

- Multimedia-based training saves training time (and related costs) compared with conventional training. For the military, time reductions are typically on the order of 30 percent, with 60–70 percent observed in some cases (Fletcher, 1996).
- Overall training costs are less for multimedia-based training than they are for conventional training. If the training population is large enough, the lower costs related to training delivery provided by multimedia training more than offset the acknowledged lower costs in development of conventional training (Hall, 1995).
- Multimedia-based training results in higher levels of learning, retention, and transfer compared with conventional instruction. At worst, multimedia-based training produces learning equal to conventional training (Allen, 1998; Fletcher, 1996; Hall, 1995).

### c. Simulation

Simulation is used to provide practical exercises in military tactics. All tactical training exercises are simulations to the extent that they demand that the individual or collection of individuals react to simulated conditions as if they were real. In fact, a popular aphorism in military training circles is that "everything short of actual battle is simulation." However, Gorman (1991) was one of the first authorities in military training to distinguish among three different types or categories of simulation:

- **Live simulation.**<sup>5</sup> Live simulation refers to training that uses actual equipment in an environment that closely replicates real-world combat conditions. The original concept of live simulation was full-scale "war games" mediated by human umpires. The need for human mediation has been drastically reduced because a variety of technological interventions now stimulate actual command and control (C2) equipment, simulate weapons effects, and score and archive performance automatically.
- **Virtual simulation.** In virtual simulation, people train by interacting with a physical or computer-generated representation of the actual equipment. The historical antecedents for virtual simulation are the aircraft cockpit trainers developed during World War II. Today, virtual simulation is not limited to aircraft, but also includes land and sea weapon systems. Virtual simulators can be used to train basic and advanced skills. They are particularly useful in training tasks that would be difficult to train on the actual equipment, such as potentially dangerous actions or situations or tasks that could damage actual equipment.
- **Constructive simulation.** The tradition of constructive simulation evolved from war games that were typically conducted on a board or table top. These simulations are typically used to impart knowledge and skills related to command, control, and communication (C3) topics. These games have evolved by incorporating computer-based analytic models to resolve the results of tactical engagements. Compared with virtual simulation, constructive simulations represent a larger area of operation with larger aggregates of units and provide a less-than-virtual (i.e., two-dimensional, top-down) representation of the battlefield. Constructive simulations continue to be used to train C3 skills. Examples are the Army's Janus system and the proposed Joint Services Simulation System.

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<sup>5</sup> Gorman originally labeled live simulation as "subsistent," but the term "live" has been the more popular term for this category.

One of the latest developments in simulation is the capability for communication among simulations. Distributed interactive simulation (DIS) systems represented the first generation of such linking technologies, and permitted the networking of computers for common operations. This technology has been used in training systems since the 1980s—the best known example being the Simulation Networking (SIMNET) system. SIMNET is a single-Service (Army) simulation of virtual simulators located in relative close proximity (i.e., on a local-area network [LAN] (Alluisi, 1991)). Since then, large-scale DIS systems have been developed. These systems link dissimilar simulators located at relatively distant stations. An example large-scale DIS training system is the Multi-Service Distributed Training Testbed (MDT2), which links virtual and constructive simulations of land and flight simulators to train close air support (CAS) (Orlansky et al., 1997). A more ambitious project is the Synthetic Theater of War (STOW), which has linked constructive, virtual, and live simulators to drive a Joint Task Force (JTF) exercise. Both MDT2 and STOW are considered demonstration projects for developing operational systems for training and mission rehearsal. The U.S. technology has been successfully transferred to the United Kingdom for use in multi-national exercises. These latter examples underscore the potential for linking technologies to connect numerous simulations into a large-scale system capable of training many people located at distant sites.

## **5. Required Competencies**

Modern learning theories (e.g., Anderson, 1993) distinguish between two fundamental types of human knowledge:

1. **Declarative knowledge.** Declarative knowledge refers to our conscious knowledge of facts and characteristics upon which we can form inferences
2. **Procedural knowledge.** Procedural knowledge refers to our unconscious knowledge and performance skills that guide our actions.

As discussed below, the relative importance of this knowledge differs as a function of the three primary content areas of military instruction: operational procedures and tasks; tactics and techniques; and strategy.

### **a. Operational Procedures and Tasks**

This category refers to actions of individuals or small teams (e.g., crews) to operate specific weapons systems and other military equipment. Example tasks include preparing the M1 tank gunner's station for operation, maintaining straight and level flight on the F-16, and performing operator's maintenance on a half-ton truck. Although some tasks in

this category require a degree of perceptual-motor skill, most are predominantly procedural in nature. Furthermore, the perceptual skill component of these operational procedures is decreasing as weapons and other military systems designers incorporate more and more automation features. Because of the simple procedural nature of most operational tasks, they are relatively easy to learn. On the other hand, procedural tasks are also notoriously easy to forget (Hagman and Rose, 1983).

To the extent possible and practical, hands-on training is the primary means of initial instruction. For many of these tasks, job aids (e.g., technical manuals, embedded helps) have been developed to help job incumbents remember and perform actions. Typically, these tasks are initially trained in basic or entry-level courses of instruction. Skills are maintained through sustainment or continuation training programs conducted in units for individuals and crews. Skill sustainment programs typically use hands-on training methods, but individual and crew virtual simulators are increasingly being employed for training operational procedures.

#### **b. Tactics and Techniques**

Tactics and techniques are methods by which military equipment and personnel are used to achieve specific military ends. Tasks in this category form the core of warfighting actions. The distinction between tactical and operational tasks is often blurred because tactics incorporate basic procedures. The difference lies in the intent. For the procedures, the goal is to operate the equipment. For tactics, in contrast, the purpose is to use the equipment in combat engagements. Most tactical tasks are collective in nature, but the collections vary widely from small teams (e.g., rifle squads or fire teams) to large collections comprising teams of teams (e.g., brigade combat teams, multi-ship task forces, air combat wings). The nature of tasks also varies widely, requiring different mixes of declarative and procedural knowledge. At one extreme are the tasks predominantly guided by procedural knowledge. These include linear (i.e., non-branching), rapid-reaction drills, such as engage armored targets, conduct air-to-air combat, and execute herringbone formation. At the other end of the spectrum are the tasks that have some procedural components but require considerable declarative knowledge and conscious reasoning, including individual and collective decision making. Although such tactical tasks are complex, they typically can be interpreted as "well-structured" problems because they can be shown to have a single solution or a finite and homogeneous set of correct solutions. Examples of complex tactical tasks include planning deliberate defensive mission, executing movement to contact, and conducting urban combat.

Typically, tactical tasks are initially trained in basic and advanced courses for junior-grade NCOs and officers through a combination of conventional instruction and practical exercises. Field exercises are used to enhance and maintain tactical skills in units, although a variety of simulation technologies are increasingly used to train advanced tactical skills. Tactics, especially those pertaining to higher echelons, are trained in military staff colleges and institutions as Service personnel advance as mid-career officers. Live simulations, such as the Army's NTC and the Air Force's Red Flag exercises, train C2 skills and fundamental engagement tactics. Networked virtual simulations (e.g., the Army's Close Combat Tactical Trainer [CCTT] and the Navy's Battle Force Tactical Trainer [BFTT]) provide training in control and coordination of system operators. Battle staff training is often provided by constructive simulations, such as the Army's Brigade/Battalion Battle Simulation and the Air Force's suite of wargaming software used in Blue Flag exercises at the Battlestaff Training School. The development of large-scale DIS systems, such as STOW, increases the potential training audience for tactical training even more.

### **c. Strategy**

Military strategy refers to planning and achieving long-term wartime goals using large-scale force structures. Like the distinction between tactics and procedures, the conceptual line between strategy and tactics can also be blurred because tactics provide the means by which strategies are implemented. However, the distinction is not one of action; rather, it is one of scale. Strategies refer to more complex problems, taking into consideration national, global, and military considerations. Further, in contrast to problems in tactics, strategic problems are typically "ill-structured" because very few procedures pertain and solutions must be consciously sought through analogy and inference. As a result, problems often have multiple and qualitatively different types of "correct" solutions. Because of this characteristic, instructors often find that studying "incorrect" responses to strategic problems is as illuminating—if not more so—than studying "correct" responses.

Topics related to strategy are introduced in the various Service staff colleges and institutions, which train officers in mid-career positions. However, the execution of military strategies is traditionally regarded as the purview of general and flag officers and is more thoroughly covered in the U.S. senior colleges and institutions, such as the National, Army, Naval, and Air War Colleges. Training typically employs lecture and discussion methods. Because of the scale of strategic planning and action, comparatively fewer simulations can support training in strategic reasoning. An exception to this is the Capstone Course for newly selected general and flag officers. In this course, a 2-day decision

exercise (FUTURE GAMBIT) simulates a regional crisis. In this simulation, computer models support decision making and simulate the conditions and effects of large-scale warfare.

## **6. Training and Cost-Effectiveness Issues**

Because of the criticality and the expense related to military training, effectiveness and cost issues provide continuing issues for research. In concept, the effects of training interventions should be measured in terms of combat outcomes (i.e., the extent to which they improve combat effectiveness). Because such measures are difficult to obtain, substitute or "surrogate" measures are often used to measure the effects of training. These include process measures of behavior (e.g., the speed and accuracy of performance on collections of tasks or subtasks) and product measures of behavior (e.g., the numbers and types of targets hit in a gunnery exercise). These measures are assumed, with some justification, to correlate with combat outcomes, but there is little or no empirical research confirming this link.

Effectiveness is, in essence, only half the question here. To evaluate training programs, analysts must also consider cost. Initial cost-effectiveness models focused on identifying the least expensive training approach for achieving some acceptable standard of performance (i.e., cost minimization). Recently, the focus has shifted to determining methods, devices, or mixes thereof that deliver the greatest performance for a given level of funding (i.e., performance maximization). This latter approach is implied when military leaders ask researchers to identify training technologies that provide "the most bang for their buck."

## **7. Reference Sources**

In the United States, military research is supported by a variety of resources. Perhaps the most comprehensive resources are the defense laboratories for studying behavioral science issues, such as the Army Research Institute for the Behavioral and Social Sciences (ARI), the Navy Personnel Research and Development Command (NPRDC), and the Human Effectiveness Directorate of the Air Force Research Laboratory (HED/AFRL). These institutions are devoted to applied research on issues related to human performance, including training. Another important resource is the National Center of Excellence for Simulation and Training Technology. Located in Orlando, Florida, this center brings

together the military Services, universities, and private industries that have a continuing interest in state-of-the-art training technology.

Detailed information on military occupations is maintained in the Comprehensive Occupational Data Analysis Program (CODAP), which was originally developed by the U.S. Air Force in the mid-1960s. CODAP describes the elements of military jobs (i.e., individual tasks) by a set of standard characteristics or factors. Example factors include relative time spent performing job tasks and the difficulty in learning job tasks. Such information has proved useful for designing training and jobs and for selecting and classifying personnel. The Executive Agent (EA) for CODAP is now the U.S. Navy, who maintains information on jobs in all military Services. Also, much work has been done in converting CODAP procedures and databases for the civilian job sector.

Older weapon systems and other types of military hardware were often designed without consideration of human performance and training issues. Because of the enormous cost involved in re-engineering systems, military policy stipulates that training issues, along with other human performance issues, must be considered in the acquisition of new weapons systems. Each military Service has human factors programs integrated into their systems acquisition programs: Army MANPRINT, Navy HARDMAN, and Air Force IMPACTS. These programs are now consolidated for all the Department of Defense (DoD) under a single umbrella concept called Human Systems Integration (HSI). Nevertheless, the processes for conducting the analyses associated with the HSI programs are still called MANPRINT, HARDMAN and IMPACTS.

## **B. CIVILIAN TRAINING**

Training in the civilian sector of American society is characterized by two elements: ubiquity and diversity.

In examining American society to find the contexts where training took place, every door we opened seemed to reveal that training was being provided. Public agencies, private corporations, unincorporated organizations and individuals provide training. In essence, just about anywhere training could happen, training happens.

Diversity is the other hallmark element of training in the civilian sector. Generalizations about the manner in which training occurs in the various venues are precarious. For example, corporations use internal agencies for training, outsource training, send people to training, and send training to people—in the form of distance technologies that bring the training to the workers' workplace or home.

Understanding why ubiquity and diversity characterize training is not difficult. Decisions about how, where, and when to provide training are pragmatic. In contrast to education, policy and law that regulate civilian training are considerably limited. Consequentially, training occurs in many places and in many ways. While this may be desirable to meet training needs, it confounds efforts to provide accurate information about the extent and nature of training in civilian contexts. No central authority has the mandate to collect information about training, and no comprehensive data-based study of training in America exists. What follows then is an effort to map the domain of training in the civilian sector by describing the principal venues of training.

The sections that follow discuss the major types of venues for civilian training and show the pervasiveness of training throughout American public and private organizations.

## **1. Vocational Training in Public High Schools**

A long-standing feature of U.S. public education is that public schools should provide training to enable secondary school students who do not intend to go to college to enter the workplace after high school. The most familiar aspect of vocational education in public K-12 schools is the "shop class," which has been a part of comprehensive secondary schools for many years. Auto mechanics, woodworking, metalworking, and other skills are commonly offered in the vocational classes in secondary schools.

As noted earlier, vocational education can be traced back to the Academy, which was established by Benjamin Franklin in Philadelphia. Vocational education in the comprehensive high school, as it came to function through most of the 20<sup>th</sup> century, was a result of the "manual training" movement that began in the later part of the 19<sup>th</sup> century. John D. Runkle, the President of the Massachusetts Institute of Technology (MIT), saw a display of the method developed by Victor Della Vos, a Russian educator at the Moscow Imperial Technical School, at the 1876 American Centennial. MIT established a School of Mechanical Arts based on Vos' method, which involved an analysis of the components of the various trades. Students would receive a carefully prescribed set of sequenced instruction so they could acquire a particular occupational skill (Roberts, 1957).

In the first part of the 20<sup>th</sup> century, the manual arts curriculum in high schools gradually evolved into the standard vocational curriculum. The vocational curriculum came to be comprised of three topic areas:



1. **Consumer and homemaking education.** This curriculum provided training in home economics, child development, parent education and other similar matters that involve life rather than job skills.
2. **General labor market preparation.** This curriculum included keyboarding, business math and English, industrial arts, and career exploration.
3. **Occupationally specific education.** This curriculum included courses in different fields (e.g., agriculture, business, marketing, health, occupational home economics, trade and industry, and information technologies).

Every state in the United States is required to establish a Board of Vocational Education, which has the responsibility to develop a plan for vocational training and to supervise the system of vocational education in the state. All public secondary schools provide some vocational training, and almost all students who graduate from high school have credits in vocational course work. The percentage of students with credits in vocational education has dropped only slightly in the 10- year period (1982–1992) covered by a report from the National Center for Education Statistics (Tuma and Burns, 1996). In 1982, 97.8 percent of all high school graduates had credits in vocational education. In 1992, 96.5 percent had credits in vocational education. While nearly all high school students graduate with some vocational credits, the average number of vocational credits earned by graduates is 3.8 (of the total of 23.8 credits).

The question of the quality of vocational training in equipping students with marketable job skills is open to interpretation. The Bureau of Labor Statistics (BLS) estimates that only 5 percent of American workers qualified for their jobs by skills learned in high school vocational education programs. Nevertheless, the past several years have seen a substantial increase in interest in vocational education under the label of “school-to-work” programs (Carnevale and Goldstein, 1990).

In 1991 the U.S. Department of Labor Secretary’s Commission on Achieving Necessary Skills (SCANS) released its report, entitled *What Work Requires of Schools*. This report was focused on the training needs of the approximately 60 percent of high school students who do not go to college. The SCANS report (Department of Labor, 1991) came at a time of considerable concern about the quality of the American work force and was an important force for generating a rekindling of interest and effort pertaining to vocational training in schools. “Education for employment” became a common theme in discussions that focused on needed improvements in schools. As such, vocational education experienced something of a Renaissance.

The SCANS report identified the skills and personal qualities required for success in entering the work force. The approach taken by the SCANS report was at variance with the traditional orientation of vocational education. Unlike the vocational training tradition that began with the work of Runkle in the last century and continued for nearly 100 years, SCANS focused on generic skills rather than on specific occupational skills. The SCANS report asserted that workplace "know-how" is comprised of capabilities and traits, such as basic reading, and communication skills; thinking skills; integrity; self-management; individual responsibility; interpersonal skills; ability to use resources of time, materials, space, and staff effectively; information handling skills; understanding of systems; and capability of using tools and equipment.

Consistent with the SCANS report, vocational education has increased its attention on developing curricula centered on "generic skills" rather than occupation-specific skills. The interest in generic skills stems from the recurring opinion that a substantial discontinuity exists between what is taught in schools and the knowledge and skills needed for occupations. In essence, the belief is that schools need to provide capabilities, dispositions, and cognitive abilities that enable the person to contend with a variety of situations and conditions rather than a set of knowledge and skills that are particularized to a specific job. Studies of both vocational and other academic secondary school programs suggest that schools do not teach the needed skills (Berryman, 1988; Powell, Farrar, and Cohen, 1985; Stern et al., 1985).

The single largest effort to provide vocational training in secondary schools was a result of the School-to-Work Opportunities Act of 1994. This law provides the states seed money to design their own comprehensive school-to-work program. States and localities have considerable freedom in designing their own programs as long as the program includes the act's three components: school-based learning, work-based learning, and connective activities. School-to-work programs must include significant involvement of the private sector and must also provide learning activities in the workplace.

School-to-work programs exist in all 50 states and more than 1,000 communities at the elementary and the secondary level. In the report of the program to Congress in 1997, 1 million of the 13 million secondary school students participated in at least one component of the school-to-work programs. However, the actual in-depth penetration of school-to-work programs among secondary school students was substantially smaller. Only 2 percent of all secondary school students could be described as having participated comprehensively in school-to-work activities, which included a paid or unpaid work experience

linked to school or an integrated curricula focused on a career. The number of businesses participating in school-to-work partnerships in 1996 was 200,000 (Department of Education/Department of Labor, 1996).

The administrators of the school-to-work program at the Federal level claim that the program is making fundamental changes in how students learn, how teachers teach, and how employers work with schools. Systematic and comprehensive evaluation of the school-to-work program has not been undertaken. Even if the claim that fundamental changes have resulted from the school-to-work program is correct, the numbers of students affected by it remains small.

## **2. Employer-Provided, Formal Job Training Programs**

The single largest category of training in the civilian sector is the employer-provided training programs. The Department of Labor's BLS provides periodic reports of training in the private sector. In the 1995 survey of the 6-month period between May and October 1995, the BLS reported that employees in businesses with 50 or more workers received an average of 10.7 hours of training. The industries that provided the most hours of formal training were transportation, communications, and public utilities, with 18, 17, and 14 hours, respectively, in the 6-month period. The industries that provided the fewest number of hours of formal training were retail trades and construction, with 4 and 5 hours, respectively (Bureau of Labor Statistics, 1996).

The amount of money spent on training per employer provides another indication of the nature of the training. There is an association between the amount of expenditures and the size of the establishments. The BLS indicates that businesses with 50 or more employees spent an average of \$139 per employee on the wages and salaries for in-house trainers during 1994. Firms with 50-99 employees spent \$52 per employee on wages and salaries for in-house trainers. Businesses with 500 or more employees spent \$236 per employee for in-house trainers.

The most common types of formal training provided by companies were classes or workshops conducted by company training personnel. In a 1995 BLS study, 76 percent of those employees who received formal training received this training in company-sponsored classes or workshops. This type of training was followed by training in classes or workshops conducted by outside trainers (48 percent) and by attending conferences, seminars, or lectures (36 percent). Only 17 percent of employees reporting training in the 12 months

covered by the BLS study reported receiving training by taking courses at educational institutions (Bureau of Labor Statistics, 1996).

The use of outside trainers enables employers to maintain flexibility in accomplishing training needs and also can be a means of reducing the overhead costs of training. Outside trainers come from a variety of sources (e.g., private training firms, higher education, and self-employed consultants). Less money is spent on purchasing training from outside training sources. The relationship between payments to outside trainers and size of firm was similar to that which was found with in-house training. The range of expenditures varied from \$63 per employee for the firms with 50–99 employees to \$135 per employee for firms with 500 or more employees (Bureau of Labor Statistics, 1996). No data are available to provide a comprehensive picture of the details of the nature of training provided by outside trainers beyond the type of information reported by the BLS.

The development of training units within corporations traces its origin to the latter part of the 19<sup>th</sup> century. The structure and content of the in-house training units and the training offered varied considerably from those that offered courses in English for non-English speakers, technical topics, salesmanship, accounting, and management theory—among other topics.

The development of training units within corporations dates to the early part of the 20<sup>th</sup> century. In 1913, 35 corporations formed the National Association of Corporation Schools whose purpose was to provide an exchange of information and to collect data on successful programs (Eurich and Boyer, 1985). Beginning with a handful of corporations with training units, most large corporations developed internal training departments.

The extent and source of training for workers vary in relationship to the occupation of the worker. In 1991, 65.3 million people (57 percent) of workers reported that they had received training to do their job. This is an increase of 2 percent from 1983. Twelve percent of those who reported having received training said that they had received the training from some formal training program in their company. Thirty-three percent reported that they had received the training in a school. (One-half of these persons reported that the school was a 4-year institution.) Twenty-seven percent reported that the training came from an OJT program (Shackleton, 1995).

As shown in Table III-2, the percentage of persons reporting job training varies considerably according to occupation. Formal training provided by the company is

**Table III-2. Workers Who Had Continuing Training While in Their Job, by Occupation (1983 and 1991 Current Population Survey)**

Occupation	Trained in Job (Percent)		Source of Training (Percent)			
	1983	1991	School	Formal Company	Informal OJT	Other
Exec/Admin/Managerial	47	53	18	25	18	12
Professional Specialty	61	67	20	20	17	15
Technical and Related	52	59	7	26	22	9
Sales	32	35	12	16	15	6
Clerical/Admin Support	32	40	12	16	16	4
Private Household	3	6	2	—	1	3
Services	25	29	7	9	13	5
Farming/Fishing/Forestry	16	21	7	3	7	7
Craft and Related	35	38	9	17	16	4
Machine Operators and so forth.	22	25	4	8	15	2
Transportation	18	25	2	10	11	3
Cleaners, Laborers, and so forth.	14	15	1	5	9	1

**Note for Table III-2:** *Adapted from Shackleton (1995).*

reported to be the highest among technical workers. While the percentage of reported formal training provided by the company is only slightly smaller among executive, administrative, and managerial workers (26 and 25 percent, respectively), technical workers reported substantially less reliance on training from a school than did the executive, administrative, and managerial workers.

As indicated previously, a positive correlation exists between the amount of training and the size of firm (i.e., larger firms tend to provide more training). Yet, one analysis of training reported that more than one half of all training expenditures by U.S. corporations come from less than 10 percent of all U.S. companies (Shackleton, 1995).

One of the most highly conspicuous forms of internal corporate training is the corporate university. Many corporate universities are closely modeled on universities and frequently make use of many features of universities, such as course catalogs, a logo, and the physical design of the facility (which resembles a traditional university). The corporate

university can even award graduation certificates and have their own university ring (Meister, 1994). A sample of these corporate universities includes Holiday Inn University, Motorola University, Disney University, Target University, and Hart Schaffner & Marx University. Some corporate universities award degrees at the doctoral or master's level. Eurich and Boyer (1986) speculated that hundreds of corporate degree programs could emerge in the next 50 years.

Even corporations that have a corporate university seldom limit training to these programs. These corporations also use courses purchased from third-party training vendors, hire outside personnel to provide specialized instruction, join consortia that offer training, or send personnel to other public or private training facilities (Meister, 1994).

### **3. Union and Professional Organizations Training**

Trade unions have been an important source of worker training for more than 100 years. Unions have expanded training opportunities for union members by negotiating funding for such training in contracts and by providing training as a benefit to union members through funds from dues, state or federal funding, or foundation grants. Labor unions' involvement in the delivery of training takes two major forms: One is the training provided under the aegis of the union, and the other is training funded by contractual agreement between labor and management and jointly administered by union and management parties to the contract. The following section will discuss joint union/management training.

More than a quarter of a century ago, Rogin and Rachlin (1968) published a study of training in labor unions. At that time, they reported on training provided by 40 unions, 24 university labor education centers, the National American Federation of Labor-Congress of Industrial Organizations (AFL-CIO) Education Department, and AFL-CIO Education state and city councils. At that time, much of the focus of union training pertained to union development and leadership. Training was provided on topics such as union administration, collective bargaining, leadership skills, and political action. Training was often delivered in conferences, 1-week residential schools, and evening classes. Some colleges provided non-credit 2-year programs.

A study conducted by Gray and Kornbluh (1990) provided more recent data on union programs. Their study did not furnish information on the extent and locus of union training programs but did identify five changes in union sponsored or delivered training and current emphases of labor union sponsored training:

1. Labor education is reaching new constituencies and includes white-collar and service employees, women, minorities, immigrants, workers' families, disabled workers, and secondary school teachers and students.
2. The content of labor education has expanded and now includes topics such as labor-management approaches to workplace issues and workplace organization; strategic planning and technological change, health and safety; substance abuse; concerns and issues pertaining to women, minorities, and immigrants in the workplace; language and computer literacy; economic and technological trends in specific industries; and teaching about labor in the schools.
3. Labor education programs use of a variety of instructional methods, including study circles, games, one-on-one interactions, and computers.
4. New delivery systems, such as college degree programs, distance learning, and teleconferencing, have been used.
5. New labor education providers have emerged, such as the George Meany Center for Labor Studies, (which was established in 1968), community colleges, and coalitions for worker safety and health.

The most prevalent form of training provided by labor education takes the form of short-term workshops, but one of the major developments in labor education has been the emergence of college degree programs. Some college degree labor education programs are targeted to specific unions, whereas other programs recruit participants within a geographic area across various unions.

At the national level, the George Meany Center for Labor Studies is a union-sponsored training center. Its training topics include hazardous materials for railway operators and AIDS in the workplace, and it provides a National Clearinghouse for Occupational Safety and Health Act (OSHA) information and training resources. In addition, the National Labor College of the George Meany Center offers a bachelor's degree in labor education. Students are required to have a high school or equivalent diploma and a minimum of 84 quarter hours of college credits. Students complete the degree program with periodic weeklong residencies and correspondence work with the college faculty. The National Labor College, in conjunction with the University of Massachusetts at Amherst also offers a master's degree in labor studies.

Two developments in the past couple of decades were significant in expanding involvement of unions in training activities. The first development was the passage of OSHA (the Occupational Safety and Health Act) in 1970. OSHA also generated training activities that are provided by unions and joint union-management training programs since

OSHA required workers to be informed about job-related health and safety issues and to be trained to contend with job hazards.

The second development was the explosion of computer-related technologies in the workplace. Union-sponsored or union-delivered training that pertains to technological challenges takes several forms. Unions have provided training to union leaders to enable them to be proactive in addressing worker skill needs, retraining, and worker displacement. The American Federation of State, County, and Municipal Workers, the Service Employees, the Bricklayers, and the Communications Workers unions have established basic skills and literacy training for union members in response to the new demands on workers as a consequence of technological changes. In New York City, the Consortium for Worker Literacy launched a training program for workers and their families. The program was funded at a level of \$2 million per year and involved classes at union halls, factories, schools, and housing projects. The content of the training covered basic skills and enabled clients to achieve a high school equivalency certificate. Career counseling was also provided (Gray and Kornbluh, 1990).

#### **4. Joint Union/Management Training**

The early precursors of training that were supported and governed by cooperative programs involving union and management can be traced back to the early part of this century. Only more recently has the cooperative union/management approach, which is referred to as "jointism," become as extensive as it is at present.

In the 1920s and 1930s, joint labor and management programs in the railroad and textile industries supported programs that dealt with solving worker/management conflicts on the factory floor. Joint committees were an important part of the war effort during World War II, and more than 5,000 committees were formed (De Schweinitz, 1949). These programs, while not specifically focused on training, provided the antecedent for joint training activities, but joint training programs did not emerge in response to technological change and worker displacement until the 1950s and 1960s. In the 1960s, issues in health and safety played an important role in generating joint programs (Ferman, Hoyman, and Cutcher-Gershenfeld, 1990).

The joint programs typically involve grass-roots involvement in determining worker needs and in selecting and organizing training activities. In large corporations (e.g., the major automobile companies), a central facility, such as the United Auto Workers-General Motors (UAW-GM) National Joint Human Resource Center, is involved in developing,



supporting, and managing training programs. For instance, in the case of UAW-GM programs that previously were handled by UAW or GM, training has been combined under the auspices of UAW/GM jointism.

A study by Hoyman and Ferman (1991) of joint programs lists the purpose and the number of the joint programs surveyed. Table III-3 presents their findings.

**Table III-3. Purpose of Joint Labor/Management Training Programs**

<b>Purpose</b>	<b>Number of Programs</b>
Safety and Health	33
Upgrade	26
Communication Skills	24
Displaced Workers	17
Personal Development	15
Basic Skills	13
Staffing	13
Out Placement Training	7
Other	4
<b>Total Number of Responses</b>	<b>152</b>

**Note for Table III-3:** Taken from Hoyman and Ferman (1991).

The most conspicuous of the joint programs have been those in the automotive and communications industries. Collective bargaining agreements in these industries specify the programs, governance, and provisions for financing the joint programs. In the automotive industry, the joint programs were commonly referred to as the "nickel fund" since 5 cents from every hour worked was allotted to support the cost of these programs. In smaller firms, the funding may not be written into the collective bargaining agreement but may be done on a case-by-case basis (Ferman, Hoyman, and Cutcher-Gershenfeld, 1990).

Joint programs have been led to several innovations. For example, the UAW-Ford joint training program initiated the Life Education Advisor. This program involved finding workers who would serve as career advisors for workers in Ford facilities. These career counselors were equipped with information about training opportunities available to Ford workers. The counselors assisted workers in developing career life plans. Another innovative program developed by UAW-GM was the Paid Education Leave Program. In this 4-week training program, union and management personnel were given briefings and instruction by experts on different topics, such as basic economic principles, changing

world markets, emerging technologies, new patterns of industrial relations, the political and regulatory context, and strategic planning. The Life Education Advisor and the Paid Education Leave Program are indicative of training programs that go beyond specific job skills and extend to more general topics. As such, they represent a blurring of the distinction between education and training. Nevertheless, the rationale for the implementation of such programs is based on a conviction: Programs that increase the workers grasp of basic knowledge and information result in a more sophisticated work force that is better prepared to adapt and respond to ever-changing work demands (Ferman, Hoyman, and Cutcher-Gershenfeld, 1990).

Joint programs have been criticized. Among these criticisms have been union personnel concerns that money for such programs comes at the cost of reducing wages and that the money for the joint program should not go to pay for administrative costs or technical support. Such programs draw management criticism when they are perceived to serve the needs of workers in contrast to those of management or, in effect, represent a way for management to cover the cost of training they require through the joint union and management fund. While joint programs draw support in some quarters because they bring union and management together, some union personnel feel that these programs bring union leaders into a relationship that is too close to management and that results in the union leadership being co-opted by management. Managers have also expressed concern that they are giving up a control of their hierarchical responsibilities (Ferman, Hoyman, and Cutcher-Gershenfeld, 1990).

Joint programs have also been lauded as a highly positive feature in the training environment. Among the specific benefits considered of jointism are the following:

- Joint programs increase the quality of the work force, which is indeed a shared objective of both parties.
- Union and management cooperation in training programs serves as a means of ensuring that both perspectives are represented in the development of the training programs, which increases the likelihood of success of the training program.
- Union involvement helps to legitimize training.
- Union and management obtain good public relations among workers.

## **5. Informal On-The-Job Training (OJT)**

Any effort to discern the locus and amount of OJT is beset with difficulty. Lowenstein and Spletzer (1994) report that the incidence of OJT varies drastically in the few surveys that have attempted to measure it. Estimates range from 20 percent (Altonji and Spletzer, 1991) to 94 percent (Lowenstein and Spletzer, 1994). The fundamental problem of obtaining accurate information on informal training is the unstructured nature of it. OJT often blends into the work activities of the individual to such an extent that any attempt to measure it is severely hampered. Lowenstein and Spletzer (1994) reported on empirical research pertaining to informal or OJT. They found that informal training is produced jointly with the primary output of the worker and is, therefore, more elusive. Workers can learn from watching other workers, may share easier ways to do the work while working or during breaks, and are indirectly instructed whenever a supervisor constructively criticizes their work. Any accurate determination of whether informal training is occurring is difficult to determine.

There is, however, reason to believe that informal training is a substantial factor in worker training. An Arc Consulting LLC study for the Center for Workforce Development examined worker training in corporations such as Motorola Inc., Boeing, Ford Electronics, and Siemens AG Power Transmission & Distribution. This study reported that 62 percent of what workers need to know to do their jobs is acquired in informal learning (Verespej, 1998). This study also identified six of the most valuable settings for informal learning (Verespej, 1998):

1. Teams
2. Meetings
3. The opportunity for customer interaction
4. Contact with supervision
5. Mentoring relationships
6. Having the time to communicate during shift changes.

The problems attending the measurement of informal training often cause it to be given less attention in discussions of training. Nevertheless, the research on informal training points to its importance in equipping workers with the job skills they actually use in their work.

## **6. Apprenticeships**

Apprenticeships are the oldest form of worker training. Historically, apprenticeship programs involved putting an aspiring tradesperson into a work situation where he could learn by watching and doing under the scrutiny and tutelage of a master in a typically unstructured way. In the United States, apprenticeship programs continue to be an important form of worker training.

The Secretary of Labor created the Federal Committee on Apprenticeship (FCA) in 1934. The FCA advises the Secretary of Labor on ways to expand and improve the registered apprenticeship system. In 1996, approximately 34,000 program sponsors provided registered apprenticeship training to approximately 367,000 apprentices. Persons in the registered apprenticeship come from diverse backgrounds and include minorities, women, youth, and dislocated workers. State apprenticeship councils of the U.S. Department of Labor, Bureau of Apprenticeship and Training register apprenticeship programs that conform to standards established by the state councils, which consist of representatives of unions and employers. Persons who complete a registered apprenticeship receive a certification as a trained skilled craft worker. (Carnevale, Gainer, and Villet, 1990). Federal regulations require a minimum of 2,000 hours of work experience and 144 hours of classroom instruction to qualify as a Department-of-Labor-registered apprenticeship program.

Formal apprenticeship programs exist in 415 trades and involve both classroom instruction and hands-on learning. Most apprenticeship programs are in the construction and manufacturing industries. Program sponsors pay training costs for apprentices. Registered apprenticeship programs are from 1 to 6 or more years in length.

## **7. Proprietary Training**

Proprietary training dates to the earliest years of American history. Proprietary training vendors range from individuals who offer training services to large-scale schools that offer training in a range of occupations, such as electronics and truck driving. Proprietary received a considerable influx of students as a result of the G.I. Bill. Proprietary schools served more veterans under the G.I. Bill than any other institution. More than 1,677,000 veterans attended private schools under the 1944 provisions of the G.I. Bill.

One problem that besets efforts to define proprietary schools as an element in the training context is definitional. Chaloux (1995) reports on a study by Wittstruck that revealed considerable variability among states concerning the definition of proprietary schools. While "for profit" was the most common definition, some states referred to any

occupational or trade schools as proprietary whether or not they were for-profit operations. In some cases, states classified schools as proprietary but with no specific definition.

Proponents of proprietary trade schools contend that such training is likely to have a closer fit with the job demands of their clients. Proponents also argue that proprietary schools can include training that goes beyond the skills of the job. Help in résumé writing, workplace decorum, punctuality, appropriate interpersonal behavior, and presentation of self in interviews are also included in the training these schools provide.

Proprietary schools also have detractors who believe that a substantial amount of training offered by these schools is poor in quality. Concern about the quality of proprietary schools was the basis for the formation of an organization to oversee the accreditation of proprietary schools. The Accrediting Commission of the National Association of Trade and Technical Schools (NATTS) was formed in response to concerns about unethical, illegal, or substandard performance of proprietary schools. In the early 1990s, NATTS was disbanded, and two national agencies that accredit proprietary schools replaced it: the Accrediting Commission of Career Schools and Colleges of Technology and the Accrediting Commission of the Association of Independent Colleges and Schools. In addition, several regional accrediting agencies accredit proprietary schools and public institutions of higher education (e.g., Middle States Association, North Central Association, Southern Association, and so forth (Prager, 1995)).

Public concern about proprietary schools was intensified by reports in the late 1980s about high rates of student defaults. The 1992 reauthorization and amendments of the higher education legislation imposed new and more stringent requirements on proprietary schools for qualifying as institutions that could provide instruction for students who obtained Federal student aid. No good information is available on the quantity of substandard or even fraudulent training vended by proprietary schools. Dorothy Fenwick, the executive director of NATTS believes that 80 percent of the schools are sound, that not much is known of 15 percent, and that 5 percent are fraudulent (Eurich, 1990). The U.S. Government Accounting Office (GAO) sponsored a study of proprietary school practices at the time of the influx of students under the G.I. Bill. The GAO study reported that 65 percent of proprietary schools engaged in questionable practices that resulted in excessive charges to the Treasury (Honick, 1995).

Data published by the National Center for Education Statistics show that there were 5,319 proprietary or private career schools in the United States in 1995 (Department of Education Statistics, National Center for Education, 1997). The typical proprietary school

had a small student body (350) when compared with the size of the typical college (8,400). In 1990, proprietary schools enrolled 1.1 million students. This is 28 percent of the full-time equivalents (FTEs) of vocational enrollment nationwide. Minority, female, and low-income students were represented to a higher extent at proprietary schools than at public colleges and universities. Minority students made up 36 percent of enrollment in proprietary schools, compared with 24 percent in public colleges and universities (Department of Education Statistics, National Center for Education Statistics, 1997). Sixty-three percent of students in proprietary schools were female compared with 56 percent in public colleges, and 34 percent of students in proprietary schools had family incomes of less than \$20,000, compared with 18 percent of students in public colleges (Department of Education, National Center for Education Statistics, 1998).

Proprietary schools rely on the marketplace for success. For this reason, successful proprietary schools may be those that are flexible in providing services for students and responsive in meeting the needs of employers when developing programs occasioned by new technologies (Hittman, 1995).

## **8. Community Colleges**

According to the *Digest of Educational Statistics* (Department of Education, National Center for Education Statistics, 1998) there number of 2-year public colleges in the United States is 1,047. Community colleges have had four major functions:

1. They have provided lower division college education for students who transfer to 4-year institutions to continue study leading to baccalaureate degrees.
2. They have furnished training for occupations in fields such as legal assistant, dental hygienist, and so forth.
3. They have provided contracted training that is quite specific to the company or industry involved.
4. They have been heavily involved in training the disadvantaged and "workfare" training.

Community colleges are about 50 years old and represent a fairly new institution having a substantial involvement in training. The open enrollment policy of community colleges has registered a clientele comprised of a substantial number of students who might otherwise not have entered higher education. In addition, the cost of community college tuition is generally substantially lower than the cost of a public or private 4-year institution

of higher education. Community colleges receive more than one-third of funds allotted under the Carl D. Perkins Vocational Education Act (Eurich, 1990).

The role that community colleges have played in training is evident. Community colleges have been particularly responsive to training needs of businesses in their service areas. They represent an important training vehicle for small local businesses that lack the resources to mount training programs within the context of their firm. Large corporations have also cooperated with community colleges. For example, in conjunction with community colleges throughout the country, General Motors has sponsored a program that trains auto mechanics to service computerized systems in cars. Community colleges have become the education and training institution of choice for minorities.

Community colleges provide four types of work-force development programs:

1. **Programs for the new job entrant.** These programs often contain basic skills training and specific job skill training.
2. **Programs for the educationally or socially disadvantaged.** These programs include job search and job survival skills, including very basic ones (e.g., being on time for work, calling in when ill, and so forth).
3. **Programs for retraining and upgrading skills.** These programs have been developed in response to rapid technological changes and the need for ongoing training to maintain employability or to retrain in case of job displacement.
4. **Contract training programs.** These programs have been developed to provide training for a particular company or industry. Contract training for companies represents an "out-sourcing" of training as a means of purchasing customized training at a favorable cost (McCabe, 1997). Community colleges have been particularly successful in selling contracted training, and community colleges that do considerable contract training have often established independent units to vend such services (Moore, 1995).

A 1996 study that secured data from 2,400 employers in 27 states found that the community college work force training programs focused on small and mid-sized businesses. This can be explained by the fact that such businesses are less likely to have in-house training departments. The employers surveyed identified three factors as contributing to the success: quality of instructional staff, cost-effectiveness of training, and responsiveness (Quinley, 1996).

Training for disadvantaged workers was part of President Johnson's Great Society program. The Area Redevelopment Act and the Manpower Development Training Act were

the earliest programs and were meant to provide training for individuals who were at or below poverty levels. These programs were consolidated in the Comprehensive Employment and Training Act (CETA) of 1973. CETA was succeeded by the Job Training Partnership Act (JTPA). These programs were intended to provide training in basic job skills along with training on seeking and keeping a job. Community colleges were the principal institutions that implemented these programs.

Proprietary schools and community colleges have been oriented to some of the same clienteles, and, as such, some degree of similarity exists between these two institutions. Nevertheless, proprietary schools and community colleges also continue to differ in significant ways (see Table III-4).

## **9. Distance Training/Internet**

The oldest form of distance training is correspondence courses, which are still widely used today. Proprietary schools and public institutions offer correspondence courses for college credit courses and for technical training. Other forms of distance training include distributing videotapes or audiotapes and providing one-way video through broadcast television. Two-way interactive video has also been used in training and typically involves the use of analog video networks. Another form of video training makes use of video transmitted via satellite connection.

Correspondence courses, audiotapes or videotapes, and broadcast television provide training resources that have generally been marketed to individuals. Companies have used two-way interactive forms of communication to reduce the costs of training either by eliminating travel costs or by increasing the number of people who can participate in the training, thus reducing the unit cost. The appeal distance training is the perception of favorable cost and performance conditions.

Distance training through the multimedia capability of the World Wide Web constitutes the newest venue for training. Such training may either through synchronous or asynchronous communication. Synchronous communication occurs when all parties participate at the same time. If 100 people are involved in training in the synchronous mode, all 100 people would be logged onto the computer at the same time and would be receiving and sharing information simultaneously. Asynchronous communication occurs when those involved in the communication participate at different times. Electronic mail (or e-mail), for example, is asynchronous communication. Internet training delivered in the



**Table III-4. Differences Between Proprietary Schools and Community Colleges**

<b>Feature</b>	<b>Public Community Colleges</b>	<b>Proprietary Schools</b>
<i>Mission</i>	Complex and ambiguous, including: Academic transfer programs Vocational training Community service Remedial education Preserving the jobs and status of faculty and staff	Simple and focused aim: Profit for the owner; offering short-term vocational training
<i>Governance</i>	Complex: Elected state and local boards State legislation Faculty governance State and federal regulation	Simple: Owners and professional managers State and federal legislation
<i>Time Horizon</i>	Long-term	Short-term
<i>Size</i>	Large	Small
<i>Links to the Rest of Higher Education</i>	Strong systematic ties through transferable credit and articulation with 4-year institutions and other community colleges Usually part of a statewide system	Limited links to 4-year institutions and other institutions that are less than 4 years Transferability of credit is limited and ad hoc May be part of a local, regional, or national chain of schools with the same owner
<i>Cost</i>	Free or minimal tuition	Significant tuition of \$4,000 or more for a vocational program
<i>Market Orientation</i>	Has assigned territory in which it is the only community college Some funding usually driven by enrollment Some competition for enrollment with other public and private institutions No need to differentiate itself from other institutions and establish a competitive advantage	Has no assigned territory; moves to find markets Completely dependent on enrollments for revenue Competes with other proprietary and public institutions in market Must differentiate itself from other public and private competitors to establish a competitive advantage that will warrant higher tuition charges

**Note for Table III-4:** Adapted from Moore (1995).

asynchronous mode has the appeal of enabling trainees to engage in training where and when they find it to be most convenient. Thus, on the World Wide Web, the two features of learning that have been viewed as most valuable in developing and delivering training have been

- The capability of asynchronous communication
- The development of on-line multimedia resources that have the possibility of making training materials more attractive and effective.

While determining the prevalence of training in other venues described in this document are wrought with difficulty, determining the training that occurs via the World Wide Web poses the most difficult problem for empirical analysis. Many statements have emphasized the value of the World Wide Web for training, but no data exist on the extent to which it is providing training to individual end-users or to workers in businesses and corporations.

## IV. CONCLUSIONS

Had this Training Handbook been published in the 17<sup>th</sup> rather than the 20<sup>th</sup> century, writing a chapter on training contexts would have been substantially easier. In the early colonial era, training was generally provided by family members or, to a much less extent, by fee-for-service tutors and masters.

As we have seen, the number of training venues has increased dramatically during the short history of our nation. This review illustrates the great variety and diversity of contexts within which training programs are conducted. In contrast, education operates within a legal and policy framework, which provides a much higher degree of structure and regularity than does training. If we wish to find out where children are being educated, we can find them in the public and private schools in any location. We can gather reasonably good data pertaining to the numbers of children being educated, the costs associated with educating them, and the curricula provided for them. Training, however, does not operate within a structure of policy or law and, as our discussion shows, the agencies and organizations that devise training contexts have used a high degree of inventiveness to meet particular training needs. The ability to provide more specificity in military training is greater since the military has better-defined jurisdiction, control, and administration of that training.

The diversity of contexts is an impediment to research on describing the content and effects of training. Consider, by comparison, educational research performed on public secondary schools in the South. Such research is likely to have considerable generalizability to other regions in the United States because secondary schools in the United States share somewhat common goals and functions. Also, of course, the laws and policies regulating the content of education throughout the United States has a reasonably high degree of similarity from state to state and region to region. This is not true of training. Consider, for instance, the OJT techniques developed for the military and those developed for civilian industrial settings. The military model may not fit the civilian situation, because the job contexts are so radically different. In addition, the extent of training provided and the means by which the training is provided by employers, unions, and proprietary vendors has very little consistency from situation to situation.

The bottom line is that a comprehensive picture of training in the United States is of necessity more impressionistic than precisely detailed. We would have liked to provide a summary table showing who, where, when, and how American society provides the training required to maintain the civilian and military sector of this nation. The data that are currently available—and even the data that we could plausibly imagine might be available—renders such a table impossible. Nevertheless, we see a rich constellation of training providers in a dynamic and continuously emerging environment that is responding to training needs.

This diversity in contexts potentially provides research opportunities in how training practices are affected by contextual factors. However, this approach to research entails a shift in research strategy that downplays main effects to focus on interactions. This approach, much like the interactionism adopted by modern social psychology, assumes that the effectiveness of a training program depends on some interaction of fundamental pedagogy (including individual student differences) and the job context. Such research would be clearly useful to the practice of training. Unfortunately, training scientists spend much effort gaining expertise in one type of context to the exclusion of examining other contexts. This stovepipe approach to training research discourages the investigation of interactions with job context. One possible solution is to increase collaboration among researchers with expertise in different contexts.

In that regard, we immodestly present ourselves, two researchers who work in markedly different contexts (Bosco in the industrial context and Morrison in the military context) as a model of collaboration for other training researchers. The paradigmatic clash of terms and concepts between the two worlds was simultaneously frustrating and stimulating.

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## **GLOSSARY**

<b>AFL-CIO</b>	American Federation of Labor-Congress of Industrial Organizations
<b>ARI</b>	Army Research Institute for the Behavioral and Social Sciences
<b>ASTD</b>	American Society of Training and Development
<b>BFTT</b>	Battle Force Tactical Trainer
<b>BLS</b>	Bureau of Labor Statistics
<b>C2</b>	command and control
<b>C3</b>	command, control, and communications
<b>CAS</b>	close air support
<b>CBI</b>	computer-based instruction
<b>CCTT</b>	Close Combat Tactical Trainer
<b>CD ROM</b>	compact disk read only memory
<b>CETA</b>	Comprehensive Employment and Training Act
<b>CODAP</b>	Comprehensive Occupational Data Analysis Program
<b>CRP</b>	Corporate Research Project
<b>DIS</b>	distributed interactive simulation
<b>DoD</b>	Department of Defense
<b>EA</b>	Executive Agent
<b>FCA</b>	Federal Committee on Apprenticeship
<b>FSU</b>	Florida State University
<b>FTE</b>	full-time equivalent
<b>FY</b>	Fiscal Year

GAO	U.S. Government Accounting Office
HED/AFRL	Human Effectiveness Directorate of the Air Force Research Laboratory
HIS	Human Systems Integration
HRD	Human Resource Development
IDA	Institute for Defense Analyses
IPISD	Interservice Procedures for Instructional Systems Development
ISD	Instructional Systems Development
JTF	Joint Task Force
JTPA	Job Training Partnership Act
LAN	local area network
MDT2	Multi-Service Distributed Training Testbed
MIT	Massachusetts Institute of Technology
NAS	Naval Air Station
NATTS	National Association of Trade and Technical Schools
NCO	non-commissioned officer
NPRDC	Navy Personnel Research and Development Center
NTC	National Training Center
NTIC	National Technical Information Service
O&M	operating and maintenance
OJT	on-the-job training
OPFOR	opposing force
OSHA	Occupational Safety and Health Act
PC	personal computer
PLATO	Programmed Logic for Automatic Teaching Operation
R&D	research and development

ROTC	Reserve Officer Training Corps
SCANS	Secretary's Commission on Achieving Necessary Skills
SIMNET	Simulation Networking
STOW	Synthetic Theater of War
TICCIT	Time-Shared Interactive Computer-Controlled Information—Television
TRADOC	U.S. Army Training and Doctrine Command
UAW-GM	United Auto Workers-General Motors
YMCA	Young Men's Christian Association

# REPORT DOCUMENTATION PAGE

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13. ABSTRACT (Maximum 180 words) This document proposes research areas for computer science based upon insights into biological systems. Both humans in a combat environment and other biological systems subject to stress are considered. The briefings in the document were presented as a workshop at the Krasnow Institute as sponsored primarily by the Office of Naval Research. The briefings are designed to be sequential and mutually supporting. They discuss the combat environment challenges for computer technology, generic behavior of biological systems when confronted with information associated with stress or trauma, a generic model which draws parallels between biological and electronic computer systems, and some short term ideas about what useful research can be done which can be applied to this field. The proposals and the supporting materials are designed to be a starting point in developing a multipath set of biologically based research initiatives which would serve to release computers by approaching specific challenges with different theses and architectures.			
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